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NEW NUCLEAR DATA

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INTRODUCTION

This issue of Nuclear Science Abstracts contains the first 1955 quarterly list of new nuclear data. Additional summaries will follow in Volume 9, Nos. 12B, 18B, and 24B. Number 12B will contain a semiannual cumulation, No. 18B a quarterly list, and No. 24B an annual cumulation for 1955. The 1952, 1953, and 1954 annual cumulations are contained in Vol. 6, No. 24B; Vol. 7, No. 24B; and Vol. 8, No. 24B, respectively, and are available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for $0.25 each. Send check or money order but not stamps.

Nuclear Data Cards: As the current literature is surveyed, the new nuclear results are first printed on 3- by 5-in. cards which are collected into sets of 100 to 150 cards each month. Individuals, laboratories, or libraries may subscribe to the card sets directly by applying to the Publications Office, National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C. The price, based on actual mechanical costs, is currently $20 per year domestic and $30 per year foreign (air mail postage included for foreign but not for domestic subscriptions).

The Nuclear Data Group, which is sponsored by the National Research Council, is supported by the U. S. Atomic Energy Commission and the National Bureau of Standards.

CONVENTIONS

All energies are given in Mev and all cross sections in barns unless otherwise stated in the tabular material.

Numerals in italics, following measured values, are the errors (as reported by the authors) in the last figures of the values. In cases where confusion seems possible, the conventional ± is used.

Magnetic moments are reported as before without diamagnetic correction. They are based on $\mu(H) = 2.79267$ and the substandards listed by H. Walchli, ORNL-1469.

In writing reactions, the upper right hand superscript denoting A, the mass number of the target nucleus, is given without parentheses when the target was monoisotopic or when enriched (or depleted) material was used to establish the iden-

tity of the reacting isotope. It is given in parentheses when natural material was used but when the identity of the reacting isotope was strongly suggested by its predominating abundance, the observed reaction energy, or the activity or yield of the end product. It is given in parentheses with a question mark when the target A was assigned by systematics, elimination, etc. For instance, "B^{10}(d,p)" means that the proton groups from the deuteron bombardment of B^{10} were identified by comparing effects in B^{10} enriched and natural B samples. "B^{11}(d,p)" means that the assignment to B^{11} was made by using B^{11} depleted and natural B samples. "$C^{(12)}$(d,p)" means that natural C was used to study the reaction, but, because of the 99% abundance of C^{12}, the reaction observed was assumed to take place in that isotope. In the reaction "$Sn^{(116)}$(n,p)13^{s}In", the Sn isotope was identified by the In product. "$Te^{(125?)}$ (d,p)$Te^{(126?)}$" indicates that from the trend of Q values in the region, the experimenters believed that their measured Q most likely belonged to the indicated reaction.

When a method of production of a radioactive nucleus is given, the lowest bombarding energy used by the experimenter is indicated; e.g., Ag(20-Mev p).

The large black dots on the decay schemes are used to indicate experimentally established coincidences. α, β, or γ rays entering a level and dotted at their arrowheads have been shown to be in coincidence with gamma rays leaving the same level and dotted at their origins. In case of a simple cascade, the dots of the incoming and outgoing rays are superimposed. Dashes are used for doubtful radiations or levels.

For the light nuclei, energy levels in the compound nucleus are usually tabulated rather than the resonant energy of the bombarding particle. The binding energy of the bombarding particle in the compound nucleus is taken from the table of F. Ajzenberg, T. Lauritsen, Revs. Modern Phys. 27, 77(1955) for Z < 11, and from P. M. Endt, J. C. Kluyver, Revs. Modern Phys. 26, 95(1954) for Z from 11 to 20.

In 1954, nuclear data, reported at meetings of the American Physical Society, were not tabulated until Physical Review references for the abstracts were available. This year, they will be reported more promptly with references to the Bulletin of the American Physical Society, BAPS, and to the volume number of the Physical Review in which the Bulletin will later be reprinted.

ABBREVIATIONS

a	absorption
a $\beta\gamma$	absorption of β's in coincidence with γ's
a ce	absorption of conversion electrons
a coin	absorption of photoelectrons between counters in coincidence
α	total γ-ray conversion coefficient, N_e/N_γ
$\alpha_K, \alpha_L, \ldots$	γ-ray conversion coefficient for electrons ejected from the K, L, ... shell
$\alpha_0, \alpha_1, \ldots$	α to g.s., first excited state, ... of residual nucleus
B	band spectra method
$B_e(2)$	reduced E2 excitation probability in $barns^2$
Beγn	measurement by detection of photoneutrons from Be
B_n, B_p	binding energy of a neutron, proton to a nucleus
$\beta\gamma(\theta)$	angular correlation of β's and γ's in coincidence
calc	calculated from experimental work reported elsewhere
cc	cloud chamber
CcW	Cockcroft Walton accelerator
ce	conversion electrons
chem	chemical separation of product following reaction
Cp	Compton electrons
cryst	crystal spectrometer
d	(1) deuteron, (2) descendant of, (3) days, when used as superscript
d,p(θ)	angular distribution of protons with respect to deuteron beam
Dγn,Dγp	measurement by detection of photoneutrons or photoprotons from deuterium
$\bar{E}$	average energy
E_0	resonance energy
$E_\beta, E_\gamma, \ldots$	energy of β ray, energy of γ ray, ...
E_{dis}	disintegration energy
EA	electrostatic analyzer
E1,E2, ...	electric dipole, electric quadrupole, ...
e_A	Auger electron
el	elastic scattering

ϵ	(1) electron capture, (2) fractional transition probability for decay process observed
ϵ_K, ϵ_L	electron capture from K, L shell
f	fission, in abbreviations for methods of production or detection
F-K	Fermi-Kurie β energy distribution plot
$\gamma(\theta,T)$	numbers of γ's as function of angle and temperature
$\gamma\gamma$, $\beta\gamma$, $\alpha\gamma$, $n\gamma$	$\gamma\gamma$, $\beta\gamma$, $\alpha\gamma$, or $n\gamma$ coincidences. (0.123 γ) (0.246 γ, 0.325 γ) means 0.123 γ in coincidence with 0.246 γ and 0.325 γ
g	gyromagnetic ratio
$\gamma^{\pm}$	annihilation radiation
Γ	resonance half-width (the whole width at half-maximum)
G-M	Geiger-Müller counter
g.s.	ground state
I	(1) nuclear induction magnetic resonance method
ic	ionization chamber
IT	isomeric transition
J	spin in units $h/2\pi$
K/L	α_K/α_L
l	angular momentum of particle absorbed into or picked up from nucleus
Lin	linear accelerator
M	molecular or atomic beam resonance method
m	medium intensity
M1,M2, ...	magnetic dipole, magnetic quadrupole
mb	millibarns
Mic	microwave method
mir	measurement by total reflection of neutron beam from mirror surface
ms	mass spectrometer
μ	(1) magnetic moment in units of nuclear magnetons, (2) micron, 10^{-4} cm
μ_3	magnetic octupole moment in units of nuclear magneton barns
μs	microseconds
ν	neutrino
osc	pile oscillator method
p	(1) proton, (2) predecessor of
p res	proton resonance. Magnetic field standardized by means of proton resonance frequency
para	paramagnetic resonance method
parentheses	parentheses are put around values which are given for identification purposes
pc	proportional counter
pe	photoelectrons
ppl	photoplates or emulsions
primes	primes indicate inelastically scattered particles
q	electric quadrupole moment in units of barns
quad res	quadrupole resonance method
Q	reaction energy in Mev
s	(1) spectrometer method, (2) seconds, when used as superscript
s coh	coherent scattering
S	atomic spectra measurement
scin	1 crystal scintillation counter
scin Cp	2 crystal scintillation counter
scin pr	3 crystal scintillation counter
sd	double focusing spectrometer
sl	lens spectrometer
sl ce	conversion electrons measured in lens spectrometer
st	strong
sπ	180° spectrometer
sπ pr	180° pair spectrometer
σ	cross section in barns
σ_0	cross section at resonance energy, E_0
σ_a	absorption cross section
σ_t	total cross section
ΣA_ν	$[W(\pi)-W(\pi/2)]/W(\pi/2)$. W is the coincident count at the indicated angle
t	(1) triton, H^3, (2) total cross section when used under σ in cross section list
trans	transmission
T	(1) isotopic spin; (2) temperature
τ	half life in units indicated
τ_1, τ_2	half life of upper, lower state
$\tau_{\beta\beta}, \tau_{\epsilon\epsilon}$	half life for double β, double ϵ decay
th	thermal
VdG	Van de Graaff accelerator
w,vw	weak, very weak
%	% of disintegrations
†	relative numbers. When used in connection with γ rays, relative numbers of photons, not photons plus conversion electrons, are meant
+,–	even, odd parity when used in connection with level properties

Standard journal abbreviations are used.

TABLE 1—RADIOACTIVITY, LEVELS, ABUNDANCES, MOMENTS,

Unassigned activities from proton bombardment

τ (sec)	Target	E_p
0.4	Mg	50
4.5	Mg	80
~0.2	Al^{27}	80
~2.5	Si	20
~1	Si	50
0.2	Ti	80
0.77	Mn^{55}	95
0.55	Fe	50
0.3	Cu	130
1.3	Cu	130
0.15	Zn	100
0.8	Zn	100

H.Tyrén, P.A.Tove, Phys. Rev. 96,773(1954).

n^1 0 1 13^m

J 1/2 M

Direct measurement with neutron beam

C.P.Stanford, T.E.Stephenson, S.Bernstein, Phys. Rev. 96, 983 (1954).

H^1 1 0 stable

τ $> 10^{21y}$

From pulse rate in large scintillator of C_7H_8 with 100 ft of rock shielding

τ for bound p $> 10^{22}$ y

F.Reines, C.L.Cowan, Jr., M.Goldhaber, Phys. Rev. 96, 1157 (1954).

He^4 2 2 stable

$He^4(\gamma,p)$ $E_\gamma \leq 20$ to ≤ 40

σ curve shows max (~1.8 mb) at $E_\gamma \sim 26$

$\int\sigma$ dE = 0.016 Mev barns

p,$\gamma(\theta)$ has cos θ term ppl

E.G.Fuller, Phys. Rev. 96, 1306 (1954); Phys. Rev. 83, 202A (1951).

H^2(d,p) E_d = 0.15 to 0.45

H^2(d,n) H^3,He^3 detected, pc

$\sigma(H^3)/\sigma(He^3) < 1$ Ratio decreases with E_d

d,n(θ) more asymmetric than d,p(θ)

G.Preston, P.F.D.Shaw, S.A.Young, Proc. Roy. Soc. 226A, 206 (1954).

H^2(d,p) E_d = 190

H^2(d,n) H^3,He^3 detected

$\sigma(H^3)/\sigma(He^3) = 0.86 \pm 0.14$ at 30° c.m.

C.S.Godfrey, Phys. Rev. 96, 1621 (1954).

He^5 2 3 $\sim 10^{-21s}$

Levels Li^6(t,α) E_t = 0.24

g.s. s, pc

other ?

K.W.Allen, E.Almqvist, J.T.Dewan, T.P.Pepper, Phys. Rev. 96, 684 (1954).

He^6 2 4 0.83^s

τ 0.799^s *3* $Li^{(7)}$($\leq$ 65-Mev γ,p)

R.M.Kline, D.J.Zaffarano, Phys. Rev. 96, 1620 (1954).

Levels $Li^{(7)}$(t,α) E_t = 0.24

1† g.s. J = 0+ t,$\alpha(\theta)$

8† (1.71) J = 2+

E.Almqvist, T.P.Pepper, P.Lorrain, Can. J. Phys 32, 621 (1954).

Levels Li^7(t,α) E_t = 0.24 pc

g.s Q = 9.79 ± 0.03

1.71 *1* $\Gamma < 0.1$?

3.35* ?

*From α's observed at backward angles only

K.W.Allen, E.Almqvist, J.T.Dewan, T.P.Pepper, Phys. Rev. 96, 684 (1954).

Li 3

Abundances

Li^6 7.98% $Li^7/Li^6 = 11.53 \pm 0.29$

Li^7 92.02%

From crystal density and x ray data

D.A.Hutchison, Phys. Rev. 96, 1018 (1954).

Li^4? 3 1

τ $\sim 0.4^s$ Li(50-Mev p)

See also Be^6 Be^9(50-Mev p)

H.Tyrén, P.A.Tove, Phys. Rev. 96, 773(1954).

Li^5 3 2

He^4(p,p) E_p = 9.73 scin

Graph of p,p(θ) disagrees with Putnam's

B.Cork, W.Hartsough, Phys. Rev. 96,1267(1954).

He^4(p,p) E_p = 9.76 ppl

Data for p,p(θ) agree with Putnam's

J.M.Williams, S.W.Rasmussen, Phys. Rev. 98 (1955)

BAPS 30, #1 (New York), L3.

Level He^3(d,γ) E_d = 0.2 to 2.86

γ 16.6 *2* Γ_γ = 11 ev

E_o = 0.45 *4* σ_o = 0.6

d,$\gamma(\theta)$ ~ isotropic at E_d = 0.58

J.M.Blair, N.M.Hintz, D.M.Van Patter, Phys. Rev. 96, 1023 (1954).

Li^7 3 4 stable

Level $Li^{(7)}$(α,$\alpha'\gamma$) E_α = 1.9 scin

(0.478)

$\tau < 3 \times 10^{-13s}$ from Doppler shift of γ

$\alpha\gamma(\theta)$ isotropic within 10%

C.W.Li, R.Sherr, Phys. Rev. 96, 389 (1954).

Li^7 3 4 stable

Level $Li^{(7)}(\alpha,\alpha'\gamma)$ $E_\alpha = 5.30$ sl
0.478 *2*
$\tau < 1.3\times10^{-13}$ s from Doppler shift of γ

V.S.Zhipinel, Izvest. Akad. Nauk Ser. Fiz. SSSR 18, 65 (1954).

Levels $Li^{(7)}(\gamma,\alpha)$ $E_\gamma \leq 31$ ppl
4.7 *1* $J = 5/2$ $\gamma,\alpha(\theta)$
5.5 *1* $J = 5/2$ (3/2, 1/2 ?)
6.8 *1* $J = 5/2$ (3/2, 1/2 ?)
Possible levels at 7.4, 8.3, 9.0
$\sigma(E_\gamma = 4.7) \sim 0.15$ mb

P.Stoll, Helv. Phys. Acta 27, 395 (1954).
P.Erdös, P.Stoll, M.Wächter, V.Wataghin, Nuovo Cim. 12, 639 (1954).

Level $Li^6(n)$ $E_n = 0.035$ to 4.2
7.46 $E_0 = 0.26$ *1* $\sigma_0 = 10.3$
$J = 5/2-$ $\Gamma_\alpha = 0.06, \Gamma_n = 0.114$

C.H.Johnson, H.B.Willard, J.K.Bair, Phys. Rev. 96, 985 (1954).

Li^8 3 5 0.84 s

τ 0.841^s *4* $Be^9(\leq 65$-Mev $\gamma,p)$

R.M.Kline, D.J.Zaffarano, Phys. Rev. 96,1620 (1954).

Be^6? 4 2

τ $\sim 0.4^s$ Li(50-Mev p)
See also Li^4 Be(50-Mev p)

H.Tyrén, P. A.Tove, Phys. Rev. 96, 773(1954).

Be^8 4 4 $\sim 10^{-16}$ s

Level $Li^{(7)}(p,\gamma)$ $E_p = 1.5$ to 5
19.1 $\Gamma = 0.4$ scin($E_\gamma > 10$)

C.P.Swann, M.A.Rothman, W.C.Porter, C.E.Mandeville, Phys. Rev. 98 (1955). BAPS 30, #1(New York), RA1.

Levels $Li^{(7)}(p,n)$
(19.2) $J = 3+$, $T = 1$
Background due to $J = 1-$ and $J = 2-$, $T = 0$ states
Conclusions from analysis of available data

R.K.Adair, Phys. Rev. 96, 709 (1954).

Be^9 4 5 stable

$Be^9(n,?\gamma)$ $E_n = 3.2$ scin
No γ's observed

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Levels $Li^7(He^3,p)$ $E_{He^3} = 0.72$ scin
g.s.
1.8 *2*
2.4 *2*
3.2 *1*
4.9 *1*
p's distinguished from d's by absorption

C.D.Moak, W.M.Good, W.E.Kunz, Phys. Rev. 96, 1363; 95, 640A (1954).

Be^{10} 4 6 2.5×10^6 y

Levels $Be^9(d,p)$ $E_d = 11.9$
g.s. $l_n = 1$ d,p(θ)
(3.37) $l_n = 1$

F.S.Eby, Phys. Rev. 96, 1355 (1954).

Levels $Be^9(d,p)$ $E_d = 5.4$ to 7.4
g.s. $Q = 4.586$ *8* $s\pi$ 90°
3.37 *1* st 6.26 *1*
5.96 *1* 7.37 $\Gamma \sim 0.025$
w 6.18 *1* 7.54 $\Gamma \sim 0.010$

J.J.Jung, C.K.Bockelman, Phys. Rev. 96, 1353 (1954); Phys. Rev. 94, 748A (1954).

Levels $Li^{(7)}(t,\alpha)$ $E_t = 0.24$
~17.4 $J = 2+, 2-$ levels t,$\alpha(\theta)$

E.Almqvist, T.P.Pepper, P.Lorrain, Can. J. Phys. 32, 621 (1954).

B 5

γ B(n,?γ) $E_n = 3.2$ scin

st	0.43	1.41
	0.76	1.61
	1.02	2.0
	1.17	

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

B^{11} 5 6 stable

Levels $B^{10}(d,p)$ $E_d = 0.18, 0.29, 0.41, 0.58$
ppl; scin
d,p(θ)

		l_n
6.4†	g.s	1
1.8†	(2.14)	3
7.1†	(4.46)	0
1.3†	(5.03)	2

†$\int d\sigma$ in mb at $E_d = 0.58$. σ's given at other E_d
d,p(θ) analyzed for stripping and compound nucleus formation

C.H.Paris, F.P.G.Valckx, P.M.Endt, Physica 20, 573 (1954).

Levels $Li^{(7)}(\alpha,\alpha'+0.478\,\gamma)$ $E_\alpha \leq 2.8$
0.11† 9.86 $\Gamma = 0.125$ $J \leq 5/2$ if −
$J \leq 3/2$ if +
0.08† 10.23 $\Gamma \sim 0.155$ $J \leq 7/2$
No 10.32 level (< 0.006†)
Correction made for barrier penetration
J from comparison of reduced width with limit
†Peak cross section in barns

C.W.Li, R.Sherr, Phys. Rev. 96, 389 (1954).

B^{12} 5 7 0.03 s

γ $B^{(11)}(d,p\gamma)$ $E_d = 1.05$ scin
2† 0.940
1† 1.64

L.C.Thompson, Phys. Rev. 96, 369 (1954).

C^{11} 6 5 20.4^m

Levels B^{10}(d,n) $E_d = 0.58$ ppl d,n(θ)

		l_p
2.0†	g.s.	1
0.8†	(1.85)	3?
2.2†	(4.23)	0
0.7†	(4.77)	

†$\int d\sigma$ in mb

d,n(θ) analyzed for stripping and compound nucleus formation

C.H.Paris, P.M.Endt, Physica 20, 585(1954).

Level B^{10}(p,γ) $E_p = 0.78$ to 1.72
9.77 *4* $\Gamma = 0.57$ scin($E_\gamma \sim 9.7$)
No resonances at $E_p = 0.78$, 0.95, 1.33

T.M.Hahn, Jr., B.D.Kern, G.K.Farney, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), RA2.

C^{12} 6 6 stable

Levels $B^{(11)}$(d,n) $E_d = 1.6$ to 4.7
g.s. pc scin
(4.43)
d,n(θ) varies markedly with E_d

J.R.Risser, J.Price, C.M.Class, Phys. Rev. 98, (1955).
BAPS 30, #1 (New York), RA3.

Levels $C^{(12)}$(p,p') $E_p = 9.9$
g.s. p,p(θ)*
(4.43) p,p'(θ)**
*Diffraction effects observed
**Analyzed for direct collision and compound nucleus formation

G.E.Fischer, Phys. Rev. 96, 704 (1954).

Levels $C^{(12)}$(p,p') $E_p = 9.5$ ppl
g.s. $\sigma(\theta)$ has a max. at 100°
(4.43) σ symmetric about 90°

W.E.Burcham, W.M.Gibson, A.Hossain, J.Rotblat, Phys. Rev. 92, 1266 (1953).

Levels $C^{(12)}$(p,p') $E_p = 14$ to 19
g.s.
(4.43) σ asymmetric about 90°
(7.65)
(9.61)
p,p'(θ) does not fit direct interaction picture

R.Peelle, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), RA5.

Levels $C^{(12)}$(d,d') $E_d = 19$ ppl
g.s.
(4.43)
(9.61)
Group to level at 7.68 not observed
Graphs of $\sigma(\theta)$ given but not analyzed

R.G.Freemantle, W.M.Gibson, J.Rotblat, Phil. Mag. 45, 1200 (1954).

C^{12} 6 6 stable

Levels $C^{(12)}$(e,e') $E_e = 150$ to 188
4.4
7.7
9.7
Resolution 0.2%

J.H.Fregeau, R.Hofstadter, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), RA6.

Levels B^{11}(d,n) $E_d = 0.85$ ppl d,n(θ)

	l_p
g.s.	1,2?
4.4	1
7.7	isotropic within 25%
9.6	2
12.7	

A.Graue, Phil. Mag. 45, 1205 (1954).

γ $C^{(12)}$(p,p'γ)* $E_p = 30$ to 340
B^{11}(d,nγ) $E_d = 18$ to 50
15.2 *2* From T = 1 level? s pr
*σ(15.2-Mev γ) at 90° given
γ not produced by B^{10}(d), Be(p), B(p), O(p) for above E_d and E_p nor by Be(170-Mev α)

D.Cohen, B.J.Moyer, H.Shaw, C.Waddell, Phys. Rev. 96, 714 (1954).

γ $B^{(11)}$(d,nγ) $E_d = 10.8$ scin
100† 15.1
$N^{(14)}$(d,$\alpha\gamma$) $E_d = 10.8$
3† ~15
Be^9(α,nγ) $E_\alpha = 21.7$
6† ~15
Results consistent with assignment of T = 1, J = 1+ state to C^{12}

V.K.Rasmussen, J.R.Rees, M.B.Sampson, N.S.Wall Phys. Rev. 96, 812 (1954).

Levels $B^{(11)}$(p,γ) $E_p = 0.6$ to 2.0
(16.10) (18.39)
(17.22) (19.25)
p,(12-Mevγ)(θ); p,(16-Mevγ)(θ) as f(E_p) show that more than two of above levels are involved in interference scin

H.H.Givin, G.K.Farney, T.M.Hahn, B.D.Kern, Phys. Rev. 96, 1337; 95, 302A, 641A (1954).

Level B^{10}(d,p) $E_d = 0.15$ to 0.7
25.36 scin
Irregularities in relative intensities of four longest p groups observed at $E_d = 0.21$

C.H.Paris, F.P.G.Valckx, P.M.Endt, Physica 20, 573 (1954).

C^{13}
6 7
stable

J 1/2 I
μ 0.70198
$\nu(C^{13})/\nu(H^1) = 0.2514431$ *5*
Both nuclei in same molecule

V.Royden, Phys. Rev. 96, 543 (1954).

$C^{12}(d,p)$ $E_d = 0.52$ to 0.84
g.s. ppl
Values of $a_1...a_4$ in $\Sigma a_l P_l(\theta)$ for $d,p(\theta)$

S.Takemoto, T.Oazai, R.Chiba, S.Ito, S.Suganomata, Z.Watanabe, J. Phys. Soc. Japan 9, 447 (1954).

Level $C^{12}(d,p)$ $E_d = 1.2$
γ (3.09) E1 $e^+e^-(\theta)$ scin

S.Gorodetzky, R.Armbruster, P.Chevallier, A.Gallmann, Compt. rend. 239, 1623 (1954).

Levels $C^{12}(d,p)$ $E_d = 7.00$
g.s. Q = 2.717 *10* sπ 90°
3.090
3.684, 3.855 } $\Delta Q = 0.170 \pm 0.003$
No 0.70, 4.6 level found (< 0.5% of g.s.)

A.Sperduto, W.W.Buechner, C.K.Bockelman, C.P.Browne, Phys. Rev. 96, 1316 (1954).

Levels $C^{12}(d,p)$ $E_d = 19$ ppl $d,p(\theta)$

	l_n
g.s.	1?
(3.08)	0
(3.89)	2

R.G.Freemantle, W.M.Gibson, J.Rotblat, Phil. Mag. 45, 1200 (1954).

Levels $C^{12}(n,n)$ $E_n = 1.9$ to 3.9
6.84 $J = 3/2^+ (5/2^+?)$ $n,n(\theta)$
7.67 $J = 3/2^+$
8.29 $J = 3/2^+$
Old results corrected and extended
Phase analyses use σ_t and polarization

P.Huber, R.Budde, Helv. Phys. Acta 27, 512A (1954).

Levels $C^{12}(n,n)$ $E_n = 2.4$ to 3.7

Res.	Level	J	Γ
2.95	7.67	$3/2^+$	0.06
3.65	8.32	$3/2^+$	1.20

Phase shift analysis of $n,n(\theta)$ scin

R.W.Meier, P.Scherrer, G.Trumpy, Helv. Phys. Acta 27, 577 (1954).

C^{14}
6 8
~5600y

β^- 0.155 *1* F-K linear above 0.03
Source thickness ~15 $\mu g/cm^2$ sl

M.M.Forster, A.Oswald, Phys. Rev. 96, 1030 (1954).

C^{14}
6 8
~5600y

Comparison with S^{35} shows β spectrum has allowed shape down to 3 kev pc

A.Moljk, S.C.Curran, Phys. Rev. 96, 395 (1954).

Levels $C^{13}(d,p)$ $E_d = 5.0$ to 7.0
g.s. Q = 5.942 *11* sπ 90°
6.091
6.723, 6.894 } $\Delta Q = 0.171 \pm 0.003$

A.Sperduto, W.W.Buechner, C.K.Bockelman, C.P.Browne, Phys. Rev. 96, 1316 (1954).

C^{15}
6 9
2.4s

Level $C^{14}(d,p)2.4^sC$ $E_d = 0.6$ to 3.0
g.s. Q = 0.15 *15* scin
Q = 0.12 *5**
Excitation curve gives J(g.s.) = 5/2, not 1/2

J.A.Rickard, E.L.Hudspeth, W.W.Clendenin, Phys. Rev. 96, 1272 (1954); Phys. Rev. 94, 806A (1954); *K.R.Spearman, quoted in first reference.

N^{14}
7 7
stable

Hyperfine splitting of ^4S g.s. of atomic N observed but no evidence of q Mic

M.A.Heald, R.Beringer, Phys. Rev. 96, 645 (1954).

Levels $N^{14}(p,p')$ $E_p = 9.5$ ppl
100† g.s. $\sigma(\theta)$ has a max at ~100°
≤1† (2.31)
7† (3.95) σ symmetric about 90°
(4.91)
(5.10)
†Relative numbers of p's at 90°

R.G.Freemantle, D.J.Prowse, J.Rotblat, Phys. Rev. 96, 1268 (1954).

Levels $N^{14}(\alpha,\alpha')$ $E_\alpha = 22$ sπ 12.5°, 79°, 90°
7.01 *6*
7.94 *7*
8.45 *7* composite?
10.05 *7* composite?
Levels at 7.4, 7.7, 8.06, 9.49 not observed

D.W.Miller, U.C.Gupta, V.K.Rasmussen, M.B.Sampson, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), RA8.

$C^{13}(p,\gamma)$
8.06 level $E_p = 0.554$

γ	17†	1.66	1†	5.7 ?	scin pr
	15†	2.35	100†	8.05	
	13†	4.05			

(4.05 γ) (1.66 γ) (2.35 γ)
4.01 crossover 5 ± 5% of 2.35 γ

B.Hird, C.Whitehead, J.Butler, C.H.Collie, Phys. Rev. 96, 702 (1954).

N^{14}
7 7
stable

Level $C^{13}(p,\gamma)$ scin
γ 10.43 $\Gamma = 0.08$ $J = 2-$ $p,\gamma(\theta)$
(Channel spin 0)/(channel spin 1) = 1.5

H.B.Willard, J.D.Kington, J.K.Bair, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), RA7.

$N^{(14)}(\gamma,\alpha)$ $E_\gamma \leq 31$ ppl
σ shows structure for $E_\gamma = 14.5$ to 30($\leq$0.2mb)

P.Stoll, Helv. Phys. Acta 27, 395 (1954).

N^{15}
7 8
stable

Levels $N^{(14)}(d,p)$ $E_d = 11.9$ scin
g.s. $l_n = 1$ $d,p(\theta)$
(~5.3) forward max observed

F.S.Eby, Phys. Rev. 96, 1355 (1954).

Levels $N^{(14)}(d,p\gamma)$ $E_d = 4$ sl pr

γ	5.26 *4**	8.33 *4*
	6.33 *5*	9.13 *6*
	7.31 *4*	10.04 *4*

*May be from both O^{15} and N^{15}

R.D.Bent, T.W.Bonner, J.H.McCrary, R.F.Sippel, Phys. Rev. 98, (1955).
BAPS 30, #1(New York), X10.

γ $N^{(14)}(d,p\gamma)$ $E_d = 1.05$ scin

5†	0.84
100†	1.88
280†	5.3

L.C.Thompson, Phys. Rev. 96, 369 (1954).

Levels $N^{(14)}(d,p)$ $E_d = 5$ to 8 $s\pi$ 90°

Levels	ΔQ
5.280 *10*	
6.330 *10*	
7.165 *10*	0.149 *4*
7.314 *10*	0.263 *5*
7.575 *10*	
8.316 *10*	0.258 *4*
8.571 *10*	
9.062 *10*	0.103 *4*
9.165 *10*	
9.834 *10*	0.239 *6*
10.069 *10*	
10.458 *10*	0.085 *3*
10.544 *10*	0.160 *4*
10.705 *10*	0.106 *3*
10.811 *10*	

Level values based on g.s. Q = 8.615

A.Sperduto, W.W.Buechner, C.K.Bockelman, C.P.Browne, Phys. Rev. 96, 1316 (1954).

N^{15}
7 8
stable

Levels $C^{14}(p,n)$ $E_p = 0.25$ to 1.8
$C^{14}(p,\gamma)$ BF_3,scin

J		Γ (kev)	Γ_n (kev)	Γ_p (kev)	$\Gamma_\gamma(\gamma_0)$ (ev)
1/2−	11.30*	12	1.6	10.4	0.25
(1/2+)	11.43**	41	33	8	2.3
1/2+	11.61**	475	5	470	28

*p,n(θ) isotropic, $p\gamma_0(\theta)$ has cos θ term
**p,n(θ) and $p,\gamma_0(\theta)$ isotropic

G.A.Bartholomew, F.Brown, H.E.Gove, A.E.Litherland, E.B.Paul, Phys. Rev. 96, 1154 (1954).

Levels $N^{(14)}(n,n)$ $E_n = 2.6$ to 4.2

	J	
13.2	7/2+	n,n(θ)
13.6	5/2+	
13.8	3/2+	
14.1	5/2+?	
14.3	5/2+	
14.4	7/2+?	
14.7	5/2+	

D.Speiser, Helv. Phys. Acta 27, 427, 159A; P.Huber, H.R.Striebel, Helv. Phys. Acta 27, 157A (1954).

N^{16}
7 9
7.4s

Level $C^{14}(d,p)2.4°C$ $E_d = 0.6$ to 3.0
12.35 $\Gamma = 0.4$ scin($E_\gamma > 2$)
Level value based on g.s. Q = 10.47

J.A.Rickard, E.L.Hudspeth, W.W.Clendenin, Phys. Rev. 96, 1272 (1954).

O^{15}
8 7
2.1m

τ 2.17m *5*

Level $N^{(14)}(p,\gamma)$ $E_p = 0.3$
7.61 level. Data suggest J = 5/2±

γ	25†	5.3 *1*	scin pr ($E_\gamma > 4.5$)
	100†	6.1 *1*	
		6.6 *1*	
		7.6 *1*	$\Gamma_\gamma = 0.013$ ev

S.Bashkin, R.R.Carlson, E.B.Nelson, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), RA9.

Levels $N^{(14)}(d,n\gamma)$ $E_d = 4$ sl pr

γ	5.26 *4**
	6.12 *6*
	6.81 *4*

*May be from both O^{15} and N^{15}

R.D.Bent, T.W.Bonner, J.McCrary, R.F.Sippel, Phys. Rev. 98, (1955).
BAPS 30, #1(New York), X10.

τ 2.06m *2* $O^{(16)}$($\leq$25-Mev γ,n)

R.M.Kline, D.J.Zaffarano, Phys. Rev. 96, 1620 (1954).

O^{16} 8 8 stable

Levels $F^{19}(p,\alpha)$ $E_p = 0.873$ to 1.431

6.14		J = 3^-	$p,\alpha(\theta)$
6.91	$\Gamma \sim 0.006$	J = 2^+	$s\pi$
7.12	$\Gamma \sim 0.006$	J = 1^-	

No evidence for doublets at 6.91, 7.12
No level between 7.12 and 8.7
No evidence for 2^- level from $p,\alpha(\theta)$

R.W.Peterson, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 96, 1250 (1954); 93, 1085A (1953).

Levels $C^{12}(\alpha,\alpha)$ $E_\alpha = 4.0$ to 7.6

	J	Γ	
10.36	4^+	0.036	$\alpha,\alpha(\theta)$
11.10 ?		0.010	
11.25	0^+	3.3	
11.51	2^+	0.11	
11.62	3^-	1.6	
12.43	1^-	0.23	

J.W.Bittner, R.D.Moffat, Phys. Rev. 96, 374 (1954); 94, 769A (1954).

Levels $O^{16}(\gamma,\alpha)$ $E_\gamma \geq 31$ DDl

14.2 ?	22.6
16.8	23.2 ?
17.8	24.6 ?

J = 2, T = 0 for above levels from $\gamma,\alpha(\theta)$
$\sigma(E_\gamma = 17.6) = 0.15$ mb

P.Stoll, Helv. Phys. Acta 27, 395 (1954).

O^{17} 8 9 stable

Levels $O^{16}(d,p)$ $E_d = 5.0$ to 8.5
g.s. Q = 1.915 *10* $s\pi$ 90°
0.875 *12*
3.055 *12*
3.840 *12*

A.Sperduto, W.W.Buechner, C.K.Bockelman, C.P.Browne, Phys. Rev. 96, 1316 (1954).

$C^{13}(\alpha,n)$ $E_\alpha = 5.3$
$\sigma = 10 \pm 1$ mb. n yield 1/30 that from $Be^9(\alpha,n)$

M.E.Nahmias, P.Savel, Compt. rend. 239, 761 (1954).

O^{18} 8 10 stable

Level $O^{17}(d,p)$ $E_d = 0.855$ sd
g.s. Q = 5.821 *10* 61°,135°
1.986 *13*

K.Ahnlund, Phys. Rev. 96, 999 (1954).

O^{19} 8 11 29.4^s

β^- (2.9) log ft = 4.3
(4.5) log ft = 5.6
γ intensities show log ft $\geq$ 5.3, $\geq$ 7.3, $\geq$ 6.5 for transitions to 1.37, 0.112, g.s. F^{19} levels

γ_1	4†	0.112 *2*	$\tau \ll 10^{-6s}$
γ_2	100†	0.200 *2*	$\tau = 1.0 \pm 0.2 \times 10^{-7s}$
γ_3	67†	1.366 *8*	

$\gamma_2\gamma_3(\theta)$ supports decay scheme. See F^{19}.
No 0.22 γ (< 0.04†). No 1.59 γ (< 0.03†).

G.A.Jones, W.R.Phillips, C.M.P.Johnson, D.H.Wilkinson, Phys. Rev. 96, 547 (1954).

O^{19} 8 11 29.4^s

Levels $O^{18}(d,p)$ $E_d = 0.855$ sd
g.s.? Q = 1.730 *8* 61°,135°
0.094 *11*
1.468 *10*

C.Milelkowsky, K.Ahnlund, Phys. Rev. 96, 996 (1954).

F^{17} 9 8 66^s

Levels $N^{14}(\alpha,n)$ pc; n thresh
g.s. Q = −4.73 *10*
0.53

W.T.Doyle, A.B.Robbins, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), RA11; verbal report.

F^{18} 9 9 1.87^h

Levels $N^{14}(\alpha,p)$ $E_\alpha = 5.30$ cc

	$\alpha,p(\theta)$
6.0	$1 - 0.64\cos\theta - 1.2\cos^2\theta$
7.2	$1 - 1.1\cos^2\theta$
7.8	$1 - 1.1\cos^2\theta$

G.S.Mani, R.Pandhi, Proc. Indian Acad. Sci. 40A, 61 (1954).

F^{19} 9 10 stable

Levels $F^{19}(p,p')$ $E_p = 1.431$
0.1088 *8* $p,p'(\theta)$
0.1960 *14*
See Ne^{20} for σ's

R.W.Peterson, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 96, 1250; 94, 1075, 951A (1954).

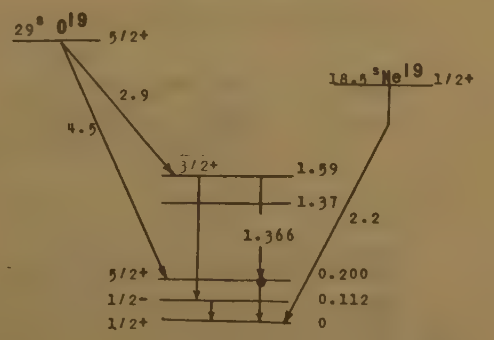
Levels $F^{19}(\alpha,\alpha'\gamma)$ $E_\alpha = 0.6$ to 2.5
0.109 J = $1/2^-$ } $\sigma(E)$; $\alpha,\gamma(\theta)$
0.196 J = $5/2^+$ }
Spin assignments consistent with $\sigma(E)$; $\alpha,\gamma(\theta)$; and τ_γ

R.Sherr, C.W.Li, R.F.Christy, Phys. Rev. 96, 1258 (1954); 94, 1076 (1954).

Levels $F^{19}(\alpha,\alpha'\gamma)$ $E_\alpha = 0.8$ to 2.0
γ 0.113 E1,E2? from γ yield
0.198 E2 from α yield/p yield

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 96, 426 (1954); BAPS 30, #1 (New York), X5.

F^{19} 9 10



G.A.Jones, W.R.Phillips, C.M.P.Johnson, D.H.Wilkinson, Phys. Rev. 96, 547 (1954).

F^{20} 9 11 12s — γ $F^{19}(d,p\gamma)$ $E_d = 1.05$ scin
1† (0.64)
2.5† (1.06)
$\sigma[F^{19}(d,p)] \gg \sigma[F^{19}(d,n+1.63\,\gamma)]$

L.C.Thompson, Phys. Rev. 96, 369 (1954).

Ne 10 — Large variations for Ne^{21}/Ne^{20} and Ne^{22}/Ne^{20} in radioactive ores attributed to $O^{18}(\alpha,n)$ and $F^{19}(\alpha,n\beta^+)$

G.W.Wetherill, Phys. Rev. 96, 679 (1954).

Ne^{19} 10 9 18.5s — β^+ ~100% (2.2) log ft = 3.3
Absence of low energy γ's shows log ft ≥ 6.0, ≥ 5.5 for transitions to 0.112, 0.200 F^{19} levels

G.A.Jones, W.R.Phillips, C.M.P.Johnson, D.H.Wilkinson, Phys. Rev. 96, 547 (1954).

Ne^{20} 10 10 stable — Levels $F^{19}(p,\alpha)$ sT; $F^{19}(p,p'\gamma)$ scin

Res.	Level	J*	$\sigma(0.109\gamma)$	$\sigma(0.196\gamma)$
0.873	13.70	2⁻	<1	~90
0.935	13.76	1⁺	130	1.1
1.290	14.10	3⁺		
1.355	14.16	2⁻		
1.381	14.18	2⁻	24	42**
1.431	14.23	1⁺	187**	~7**

(last two columns: mb)

*From p,α(θ) and p,p'(θ)
**From p,p' rather than p,p'γ

R.W.Peterson, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 96, 1250, 851A (1954).

Levels $F^{19}(p,p)$ $E_p = 0.5$ to 2.1 s
(13.438) $\Gamma_p \ll \Gamma$
(13.505) $\Gamma_p \simeq \Gamma$
(13.659)
(13.700) $\Gamma_p \ll \Gamma$ $l_p = 1$
(13.759) $\Gamma_p \ll \Gamma$
(14.157) $l_p = 1$
(14.182) $l_p = 1$
(14.230) $l_p = 0$
From preliminary analysis of p,p(θ) at 4 angles

G.Dearnaley, Phil. Mag. 45, 1213 (1954).

Levels $Ne^{(20)}(p,p')$ $E_p = 9.5$ DPl
g.s. σ(θ) has a max. at 90°
1.58 *1* σ symmetric about 90°
4.20 *1*
4.95 *2*
5.62 *2*

R.G.Freemantle, D.J.Prowse, A.Hossain, J.Rotblat, Phys. Rev. 96, 1270 (1954).

Na^{22} 11 11 2.6y — ε 11.0 ± 0.9% $\gamma^{\pm}/1.28\,\gamma$ scin

W.E.Kreger, Phys. Rev. 96, 1554, 854A (1954).

Na^{22} 11 11 2.6y — γ (1.28) $\alpha = 6.7 \pm 0.7 \times 10^{-6}$* s
*From comparison with α for 1.33 γ from Co^{60}.

R.D.Leamer, G.W.Hinman, Phys. Rev. 96, 1607 (1954); 90, 370A (1953).

Na^{23} 11 12 stable — Level $Na^{23}(\alpha,\alpha'\gamma)$ $E_\alpha = 1.5$ to 3.7
γ 0.446 $\epsilon B_e(2) = 0.041$ scin
E2 from α yield/p yield

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 96, 426 (1954); 95, 629A (1954); 98 (1955). BAPS 30, #1 (New York), X5.

Mg 12 — γ Mg(n,?γ) $E_n = 3.2$ scin
0.38 at 1.30
0.59 1.79

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Mg^{22}? 12 10 — τ 0.13^s Mg(23-Mev p)
See also Al^{23}

H.Tyrén, P. A.Tove, Phys. Rev. 96, 773 (1954).

Mg^{24} 12 12 stable — Levels $Al^{27}(p,\alpha)$ $E_p = 6.5$ DPl
0.16† g.s. Q = 1.61 *4*
0.61† 1.38
0.15† 4.18 doublet not resolved
†dσ/dω at 90°

G.W.Greenlees, Proc. Phys. Soc. 67A, 1107 (1954).

Levels $Mg^{(24)}(p,p')$ $E_p = 9.9$
g.s. p,p(θ)*
(1.37) p,p'(θ)**
~4.2 90°
5.1 *1*
5.9 *1* } Mg^{24}?
6.3 *1* pc, scin
*Diffraction effects observed
**Analyzed for direct collision and compound nucleus formation

G.E.Fischer, Phys. Rev. 96, 704 (1954).

Level $Na^{23}(p,\gamma)$
11.99 level $E_p = 0.31$

γ	11†	1.38 *2*		scin
	6†	4.11 *5*	double ?	scin pr
	1.3†	6.7 *2*		
	8†	7.7 *1*		
	7†	10.6 *2*		

No 2.76 γ

B.Hird, C.Whitehead, J.Butler, C.H.Collie, Phys. Rev. 96, 702 (1954).

Mg^{24} 12 12 stable

Levels $Na^{23}(p,\gamma)$ scin
$Na^{23}(p,\alpha)$ s

11.98 level $E_p = 0.287$

$Y_\alpha = 0.2$ $Y_\gamma < 0.005$

12.00 level $E_p = 0.310$

γ	18†	1.38	3.5†	6.75
	4.4†	2.88	15†	7.75
	2.7†	4.0	10†	10.5
	13†	4.24		

$Y_\alpha < 0.2$ $Y_\gamma = 0.37$

12.03 level $E_p = 0.338$

$Y_\alpha = 0.17$ $Y_\gamma < 0.01$

12.20 level $E_p = 0.515$

γ	12†	1.39	1.2†	7.1
	0.6†	2.86	2.4†	8.1
	1.5†	4.23	10†	10.8

$Y_\alpha < 0.04$ $Y_\gamma = 0.16$

12.27 level $E_p = 0.593$

γ	20†	1.38	12.7†	4.24
	8†	1.64*	6.1†	7.01
	10†	2.86	19†	8.09
	3†	3.93	10†	10.8

*Assigned to Ne^{20} $Y_\alpha = 84$ $Y_\gamma = 0.35$

12.35 level $E_p = 0.679$

γ	32†	1.38	7†	5.5
		1.6*	19†	7.09
	14†	2.84	39†	8.15
	10†	3.91	10†	10.9
	28†	4.23		

*Assigned to Ne^{20} $Y_\alpha < 0.13$ $Y_\gamma = 1.09$

$Y_\alpha, Y_\gamma = \alpha,\gamma$ reaction yield per 10^{10} protons
$(\sim 10.6\,\gamma)(1.38\,\gamma)$ $(\sim 8.0\,\gamma)(4.24\,\gamma, \sim 2.8\,\gamma)$
$(1.38\,\gamma)(\sim 7.0\,\gamma, \sim 8.0\,\gamma)$

F.C.Flack, J.G.Rutherglen, P.J.Grant, Proc. Phys. Soc. 67A, 973 (1954).

Levels $Na^{23}(p,\alpha_0)$ $E_p = 1.0$ to 1.9
pc

	J	
12.673	3−	p,α(θ)
12.751		
12.793	0+	
12.821	2+	
12.926		
13.43 double ?		

P.H.Stelson, Phys. Rev. 96, 1584 (1954).

Al^{23}? 13 10 τ 0.13^s Mg(23-Mev p)
See also Mg^{22}

H.Tyrén, P.A.Tove, Phys. Rev. 96, 773(1954).

Al^{25} 13 12 7.6^s τ 7.2^s Mg^{24}(825-kev p,γ)

D.W.Green, J.C.Harris, J.N.Cooper, Phys. Rev. 96, 817A (1954).

Al^{26} 13 13 6.7^s τ_1 6.4^s Mg^{25}(563,720-kev p,γ)

D.W.Green, J.C.Harris, J.N.Cooper, Phys. Rev. 96, 817A (1954).

Al^{26} 13 13 $\sim 10^{6y}$

τ_2	$\sim 10^{6y}$	Mg(15-Mev d)	chem
β^+ ?	~1		a
γ	0.5 (annihilation?)		scin
	1.9		

J.R.Simanton, R.A.Rightmire, A.L.Long, T.P.Kohman, Phys. Rev. 96, 1711 (1954).

Levels $Na^{23}(\alpha,n)$

g.s.	Q = −2.9	pc
0.3*	1.9	n thresh
1.0	2.5	
1.4	3.0	

*$\gamma^\pm$ first appears at Q = −3.2 scin

W.T.Doyle, A.B.Robbins, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), RA11; verbal report.

Al^{27} 13 14 stable

γ $Al^{27}(n,n'\gamma)$ $E_n = 3.2$ scin

0.05	1.20
0.89	1.70
1.05	2.2

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Levels $Al^{27}(p,p')$ $E_p = 4.9$

62†	g.s.		1.2†	2.22	ppl
0.56†	0.83	*10*	0.84†	3.01	
1.4†	1.01				

†dσ/dω in mb/sterad at 45°
Possible level between 2.2 and 3.0

K.B.Mather, Australian J. Phys. 7, 658 (1954).

Levels $Al^{27}(p,p')$ $E_p = 6.64$ to 8.45

0.842	4.054	5.425	sπ 90°
1.013	4.403	5.491	
2.213	4.505	5.544	
2.732	4.576	5.659	
2.977	4.807	5.821	
3.001	5.150	5.951 ?	
3.677	5.242		
3.954	5.410		

No 5.00 or 5.11 level (peaks due to C^{12})
No other level below 5.3 (yield < 5% of 0.842 level)
All values ± 0.006 Resolution 0.015

C.P.Browne, S.F.Zimmerman, W.W.Buechner, Phys. Rev. 96, 725 (1954).

Levels $Na^{23}(\alpha, p + 1.83\,\gamma)$ $E_\alpha = 1.8$ to 3.7

11.77	12.69	scin
11.93	12.72	
12.08	12.79	
12.24	12.85	
12.28	12.90	
12.35	13.00	
12.49	13.08	
12.57	13.15	

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 96, 426 (1954).

Si^{26}? 14 12 — τ 1.7^s Al^{27}(23-Mev p)
H.Tyrén, P.A.Tove, Phys. Rev. 96, 773(1954).

P^{28} 15 13 0.28^s — τ 0.27^s Si(20-Mev p)
H.Tyrén, P.A.Tove, Phys. Rev. 96, 773 (1954).

P^{31} 15 16 stable — γ $P^{31}(n,?\gamma)$ E_n = 3.2 scin
1.0 1.75
st 1.24 2.1
1.60
V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

P^{32} 15 17 14.3^d — β^- 1.712 *8* $P^{31}(n,\gamma)$ s
F-K linear ($E_\beta > 0.06$)
N.M.Anton'eva, A.A.Bashilov, B.S.Dzhelepov, V.I.Orlov, Izvest. Akad. Nauk Ser. Fiz. SSSR 18, 93 (1954).

S^{31} 16 15 2.4^s — Levels $P^{31}(p,n)$ E_p = 17.5
g.s. Q = −6.03 *15*
1.13 *20* 4.60 *15*
2.23 *15* 6.20 *20*
3.29 *15* DPl 30°, 90°, 150°
g.s. n's peaked in forward direction
A.Rubin, F.Ajzenberg, J.B.Reynolds, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), RA14.

S^{32} 16 16 stable — Level $S^{(32)}(e,e')$ E_e = 150 to 188
6.8
J.H.Fregeau, R.Hofstadter, Phys. Rev. 98(1955).
BAPS 30, #1 (New York), RA6; verbal report.

S^{34} 16 18 stable — Levels $P^{31}(\alpha,p)$ E_α = 8.1
g.s. Q = 0.5 scin
0.7 ?* 3.0 ?
2.1 3.6 ?
*Assignment to S^{34} uncertain
G.F.Pieper, G.S.Stanford, P. von Herrmann, Phys. Rev. 98 (1955).
BAPS 30, #1(New York) RA13.

S^{35} 16 19 87^d — β^- 0.165 *5* sl
Includes correction of −0.002 for 3% resolution
L.Feuvrais, T.Yuasa, Compt. rend. 239, 1627 (1954).

β^- (0.167) pc
After instrumental corrections F-K plot linear ($E_\beta > 0.005$)
A.Moljk, S.C.Curran, Phys. Rev. 96, 395(1954).

K vacancy /β = 2.3×10^{-3} *7* pc
W.Rubinson, J.J.Howland, Jr., Phys. Rev. 96, 1610 (1954).

Cl^{32} 17 15 0.31^s — τ 0.28^s S(23-Mev p)
H.Tyrén, P.A.Tove, Phys. Rev. 96,773(1954).

Cl^{34} 17 17 1.53^s — τ_2 1.53^s *2* $Cl^{(35)}$(≤22-Mev γ,n)
R.M.Kline, D.J.Zaffarano, Phys. Rev. 96, 1620 (1954).

Cl^{35} 17 18 stable — Levels $S^{(32)}(\alpha,p)$ E_α = 8.1
g.s. Q = −2.3 scin
0.7 ?
1.1
1.7 ?
G.F.Pieper, G.S.Stanford, P. von Herrmann, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), RA13.

A 18 — A^{36}/A^{38} variation of > 300% in radioactive ores attributed to $Cl^{35}(\alpha,p)$
G.W.Wetherill, Phys. Rev. 96, 679 (1954).

A^{37} 18 19 34^d — E_{Cl} 0.812 *8* recoil
O.Kofoed-Hansen, Phys. Rev. 96, 1045 (1954).

A^{40} 18 22 stable — Levels $A^{(40)}(p,p')$ E_p = 9.51 DPl
g.s. $\sigma(\theta)$ has a max. at 120°
1.48 *2* σ asymmetric about 90°
R.G.Freemantle, D.J.Prowse, A.Hossain, J.Rotblat, Phys. Rev. 96, 1270 (1954).

K^{38} 19 19 0.94^s — τ_1 0.935^s *25* $K^{(39)}$(≤22-Mev γ,n)
R.M.Kline, D.J.Zaffarano, Phys. Rev. 96, 1620 (1954).

K^{40} 19 21 1.3x10^{9y} — τ_β 9.6x10^{8y} *6* 42 β's/sec/g K
A.Hee, A.Coche, P.Keller, M.Jarovoy, M.Weck, Ann. geophys. 10, 19 (1954).

K^{42} 19 23 12.5^h — γ 10†* (0.309)
100†* (1.51)
$\gamma\gamma(\theta)$ J = 4, 2, 0
*Disagrees with results of Lazar and Bell [see NSA 8, 24B (1954)]
V.Cappeller, R.Klingelhöfer, Z. Naturf. 9a, 1052 (1954).

Ca^{39} 20 19 0.9^s — τ 0.90^s *1* $Ca^{(40)}$(≤19.5-Mev γ,n)
R.M.Kline, D.J.Zaffarano, Phys. Rev. 96, 1620 (1954).

Ca^{40} 20 20 stable — Level $Ca^{(40)}(p,p'+e^+e^-)$ E_p = 4.84
3.46 *10* J = 0 sl pr
T.W.Bonner, R.D.Bent, J.H.McCrary, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), X9.

Sc^{40} 21 19 0.22^s

τ $\sim 0.35^s$ $Ca^{(40)}$(23-Mev p,n)

H.Tyrén, P.A.Tove, Phys. Rev. 96, 773(1954).

Ti 22

γ Ti(n,?γ) $E_n = 3.2$ scin
st 0.92
1.30
2.2

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Ti^{43} 22 21 0.58^s

τ 0.58^s Ti(80-Mev p)

H.Tyrén, P. A.Tove, Phys. Rev. 96,773 (1954).

Ti^{44} 22 22 $\geq 23^y$

τ $\geq 23^{y*}$ Sc^{45}(30-Mev p,2n) chem
γ 0.16 scin
D 4.0^hSc chem Not D 2.4^dSc

R.A.Sharp, R.M.Diamond, Phys. Rev. 93, 358 (1954); " 96, 1713 (1954).

Ti^{47} 22 25 stable

Level $Ti^{47}(\alpha,\alpha'\gamma)$ $E_\alpha = 3.5$
γ 0.160 $\epsilon B_e(2) = 0.047$ scin
Previously reported 0.433 γ not in Ti*

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 96, 426 (1954); 93, 351 (1954); *priv. comm.

Ti^{51} 22 29 5.8^m

Ti^{50}(pile n,γ)
β^- 1.8 a β(0.92 γ)
2.3 a β(0.32 γ)
γ 100† (0.32) scin
1† 0.610 *15*
5† 0.920 *15*
(0.32 γ)(0.61 γ) NO (0.32 γ)(0.92 γ)
No β^- to g.s. (< 15%) β(0.32 γ)/β

W.C.Jordan, S.B.Burson, J.M.LeBlanc, Phys. Rev. 96, 1582 (1954).

V^{46} 23 23 0.4^s

τ 0.4^s Ti(23-Mev p)
See also Cr^{47} V(57-Mev p)

H.Tyrén, P. A.Tove, Phys. Rev. 96, 773(1954).

V^{51} 23 28 stable

γ $V^{(51)}$(n,?γ) $E_n = 3.2$ scin
st 0.33
0.97
1.67

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Cr 24

γ Cr(n,?γ) $E_n = 3.2$ scin
0.03† 0.75
0.10† 0.97
0.73† 1.43
†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Cr^{46}? 24 22

τ 1.1^s V(57-Mev p)
Cr(165-Mev p)

H.Tyrén, P.A.Tove, Phys. Rev. 96, 773(1954).

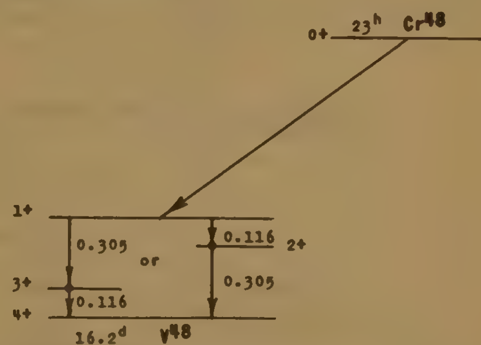
Cr^{47}? 24 23

τ 0.4^s V(57-Mev p)
See also V^{46} and Mn^{49} Cr(100-Mev p)

H.Tyrén, P. A.Tove, Phys. Rev. 96, 773(1954).

Cr^{48} 24 24 23^h

τ 23^h *1* Ni(380-Mev p) chem
D 16.2^dV
γ 95† 0.116 *4* $\alpha \sim 0.02$ M1 } sl ce
100† 0.305 *10* $\alpha \sim 0.006$ E2 } scin
No β^+ (< 2%), no other γ's (< 0.2%)
(0.016γ)(0.305γ) scin



R. van Lieshout, D.M.Greenberg, C.S.Wu, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), NA1

Mn^{49}? 25 24

τ 0.4^s Cr(100-Mev p)
See also Cr^{47}

H.Tyrén, P. A.Tove, Phys. Rev. 96, 773(1954).

Mn^{50} 25 25 0.3^s

τ 0.26^s Cr(45-Mev p)
0.28 Mn^{55}(95-Mev p)

H.Tyrén, P. A.Tove, Phys. Rev. 96, 773(1954).

Mn^{52} 25 27 5.8^d

$\beta^+/\epsilon = 0.47 \pm 0.08$ $\gamma^\pm\gamma^\pm/\gamma$ GM

R.Sehr, Z.Phys. 137, 523 (1954).

Mn^{54} 25 29 320^d

γ (0.835) $Fe^{(56)}$(d,α) chem
Anisotropy up to 90% in $\gamma(\theta,T)$ shows 0.835 γ is not dipole and that angular momentum of $e^- + \nu$ is the minimum for given J_i and J_f

M.A.Grace, C.E.Johnson, N.Kurti, H.R.Lemmer, F.N.H.Robinson, Phil. Mag. 45, 1192 (1954).

γ (0.835) $Fe^{(56)}$(d,α) chem
Polarization as $f(\theta,T)$ shows that if quadrupole, 0.835 γ is E2

G.R.Bishop, J.M.Daniels, H.Durand, C.E.Johnson, J.Perez, Phil. Mag. 45,1197 (1954).

Mn^{55} 25 30 stable

q	+0.6	MnO_3F	Mic

q coupling compared with that for ReO_3Cl

A.Javan, A.Engelbrecht, Phys. Rev. 96, 649 (1954).

Level	$Mn^{55}(\alpha,\alpha'\gamma)$	$E_\alpha = 3.5$	
γ	0.128	$\epsilon B_e(2) = 0.070$	scin
		E2 from α yield/p yield	

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 96, 426 (1954); 93, 351 (1954).

γ	$Mn^{55}(n,?\gamma)$		$E_n = 3.2$	scin
	0.58		1.50	
	0.67	st	1.86	
st	0.83	st	2.2	
	1.16			

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Fe 26

γ		Fe(n,n'γ)	$E_n = 3.2$	
	1.18†	0.84		scin
	0.39†	1.17		
	0.33†	1.67		

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

γ's	Fe(n,n'γ)	$E_n = 4.4$	
	0.85	2.1	scin
	1.20	2.5	
	1.73	3.0	

R.M.Sinclair, Phys. Rev. 98 (1955).
BAPS 30, #1, (New York), A2; verbal report.

Fe^{54} 26 28 stable

Level	$Fe^{54}(n,n'\gamma)$	$E_n = 4.4$	
γ	1.40 *2**		scin

No other γ with $E_\gamma < 3.0$

R.M.Sinclair, Phys. Rev. 98(1955).
BAPS 30, #1 (New York), A2; *verbal report.

Fe^{56} 26 30 stable

Level	$Fe^{(56)}(p,p')$	$E_p = 17$
~40°	(0.84)	

*σ in mb

Angular distribution and σ suggest applicability of the direct interaction theory [see Phys. Rev. 92,350(1953)]

G.Schrank, P.C.Gugelot, I.E.Dayton, Phys. Rev. 96, 1156 (1954).

Fe^{57} 26 31 stable

	$Fe^{57}(\alpha,\alpha'\gamma)$	$E_\alpha = 3.6$	
γ	(0.014)		scin
	0.123*		
	(0.137)	$\epsilon B_e(2) = 0.043$	

*Excitation function suggests γ emitted from 0.137 level

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 96, 426 (1954); 93, 351 (1954); 95, 629A (1954).

Co^{54} 27 27 0.2^s

τ	0.20^s	Fe(23-Mev p)
See also Cu^{57}		Ni(60-Mev p)

H.Tyrén, P.A.Tove, Phys. Rev. 96, 773(1954).

Co^{59} 27 32 stable

γ		$Co^{59}(n,?\gamma)$		$E_n = 3.2$	scin
	0.20†	0.60	0.15†	1.7	
	0.82†	1.15	0.19†	2.5	
	0.53†	1.49			

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Co^{60} 27 33 5.2^y

β^-	0.309 *3*	sl

F-K plot linear above 0.056

G.Bolla, S.Terrani, L.Zappa, Nuovo Cim. 12, 875 (1954).

No delayed $\beta\gamma$ ($\tau_\gamma < 5\times10^{-10s}$)

V.Z.Wintersteiger, Bull. Inst. Nuclear Sci., Boris Kidrich 4, 79 (1954).

$\gamma\gamma(\theta)$ from paramagnetic crystal source same at 288°K and 20°K

H.R.Lemmer, M.A.Grace, Proc. Phys. Soc. 67A, 1051 (1954).

Levels	$Co^{59}(d,p)$	$E_d = 5$	
	g.s. Q = 5.283 *8*		$s\pi$ 90°
	0.060 *3*	2.610 *6*	
	0.286 *3*	2.624 *6*	
	0.445 *3*	2.786 *9*	
	0.513 *3*	2.870 *13*	
	0.557 *5*	2.924 *9*	
	0.622 *4*	3.038 *9*	
	0.792 *3*	3.120 *9*	
	1.012 *3*	3.138 *9*	
	1.237 *5*	3.208 *9*	
	1.394 *4*	3.288 *9*	
	1.533 *6*	3.304 *9*	
	1.663 *6*	4.221 *9*	
	1.825 *6*	4.302 *10*	
	2.005 *6*	4.421 *10*	
	2.065 *6*	4.494 *13*	
	2.154 *6*	4.533 *13*	
	2.295 *6*	4.571 *13*	
	2.370 *13*		

G.M.Foglesong, D.G.Foxwell, Phys. Rev. 96, 1001 (1954).

Ni
28

γ Ni(n,?γ) $E_n = 3.2$ scin

0.05†	0.59	0.54†	1.49
0.84†	1.33	0.01†	2.7

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Ni^{54}
28 26
$<5^m$

Not observed from Ni(96-Mev p) chem; $\tau < 5^m$

R.W.Fink, Thesis, Univ. of Rochester (1953).

Ni^{55}
28 27
$<5^m$

Not observed from Ni(96-Mev p) chem; $\tau < 5^m$

R.W.Fink, Thesis, Univ. of Rochester (1953).

Cu
29

γ Cu(n,?γ) $E_n = 3.2$ scin

0.21†	0.66	0.81†	1.37
0.12†	0.96	0.16†	1.9

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Cu^{57}?
29 28

τ 0.18^s Ni(50-Mev p)

See also Co^{54}

H.Tyrén, P.A.Tove, Phys. Rev. 96, 773(1954).

Cu^{58}
29 29
3.0^s

τ 3^s Ni(23-Mev p)

H.Tyrén, P.A.Tove, Phys. Rev. 96, 773 (1954).

Cu^{63}
29 34
stable

$Cu^{(63)}(\gamma,n)$ $E_\gamma = 17.55$ to 17.67

Structure in giant resonance observed from yield of 10^mCu

D.P.Bunbury, Proc. Phys. Soc. 67A, 1106(1954).

Zn
30

γ Zn(n,?γ) $E_n = 3.2$ scin

1.3†	1.02
0.03†	1.3
0.02†	1.6

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Zn^{64}
30 34
stable

$Zn^{(64)}(\gamma,n)$ $E_\gamma = 17.55$ to 17.67

Possible structure in giant resonance from yield of 38^mZn

D.P.Bunbury, Proc. Phys. Soc. 67A,1106(1954).

Zn^{67}
30 37
stable

$Zn^{67}(\alpha,\alpha'\gamma)$ $E_\alpha = 3.5$

γ 0.092* (2 unresolved γ's) scin
0.182 $\epsilon B_e(2) = 0.043$

*Excitation function shows γ's emitted from 0.182 level

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 96, 426 (1954); 93, 351 (1954).

Zn^{69}
30 39
14^h

γ 0.435 $\alpha = 0.053$ M4 sl

A.B.Smith, Dissertation Abstr. 13,849(1953).

Zn^{69}
30 39
51^m

β^- 100% 0.914 d 14^hZn; sl

A.B.Smith, Dissertation Abstr. 13,849(1953).

Levels Zn^{68}(d,p) $E_d = 11.9$ scin

100†	g.s.	Q=4.16 *15* $l_n = 1$	d,p(θ)
40†	(0.435)	$l_n = 4$	
125†	0.77	$l_n = 2$?	
	1.6		

†Relative numbers at forward peaks

F.S.Eby, Phys. Rev. 96, 1355 (1954); 93, 925A (1954).

Ga^{69}
31 38
stable

μ_3 0.11 *2* M

Interaction constant = 84 ± 6 cps

R.T.Daly, Jr., J.H.Holloway, Phys. Rev. 96, 539 (1954).

Ga^{71}
31 40
stable

μ_3 0.15 *2* M

Interaction constant = 115 ± 7 cps

R.T.Daly, Jr., J.H.Holloway, Phys. Rev. 96, 539 (1954).

Ge^{71}
32 39
11.4^d

$e_A(L)/e_A(K) = 1.26$ pc

$\epsilon_L/\epsilon_K = 0.30$, 0.22 or 0.11 (theory) for fluorescence yield 0.45*, 0.49** or 0.54 resp.

M.Langevin, Compt. rend. 239, 1625 (1954); *Burhop, The Auger Effect, Camb. Univ. Press p. 48 (1952); **Broyles, Thomas, Haynes, Phys. Rev. 89, 723 (1953).

Ge^{73}
32 41
stable

Level $Ge^{73}(\alpha,\alpha'\gamma)$ $E_\alpha = 3.5$

γ 0.068 $\epsilon B_e(2) = 0.042$ scin

No 0.014 γ or 0.054 γ observed

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 96, 426 (1954); 93, 351 (1954); 95, 629A (1954).

Ge^{75}
32 43
49^s

τ 49^s *2* Ge^{74}(pile n,γ)

γ 0.1385 *10* K/LM > 8 sπ ce, scin

S.B.Burson, W.C.Jordan, J.M.LeBlanc, Phys. Rev. 96, 1555 (1954); 95, 613A (1954).

Ge^{77}
32 45
52^s

τ_1 52^s *2* Ge^{76}(pile n,γ)

β^- 10* ~2.7 a $\beta\gamma$
90* (2.9) scin

γ 100† 0.159 *3*
100† 0.215 *3*

(~2.7 β)(0.215 γ) No β(0.159 γ)

No (0.159 γ)(0.215 γ) *2.7 β/2.9 β = 1/9

S.B.Burson, W.C.Jordan, J.M.LeBlanc, Phys. Rev. 96, 1555 (1954); 95, 613A (1954).

Ge^{77} 32 45 12^h

β^-	~1.3	Ge^{76} (pile n,γ)	a $\beta\gamma$	
	~1.5		a $\beta\gamma$	
	2.1		a $\beta\gamma$	
γ	0.210 *1*	0.91 *2*	scin	
	0.215 *3*	1.09 *2*		
	0.265 *1*	1.19 *2*		
	0.365 *7*	1.36 *3*		
	0.410 *8*	(1.46)*		
	0.560 *10*	(1.54)*		
	0.625 *15*	1.75 *3*		
	0.710 *15*	2.00 *5*		
	0.79 *2*	2.30 *5*		

*Unresolved

$\gamma_a \backslash \gamma_b$	~0.21	0.265	0.365	0.410	0.560	0.625
0.210		Y				
0.215				Y		
0.265	Y		Y		Y	
0.365		Y			Y	
0.410	Y	N	N		Y	
0.560	Y	Y	Y	Y		
0.625					Y	
0.79		Y	Y	Y	Y	Y
0.91	Y	Y	Y	Y	N	Y ?
1.19	N	Y	N		N	N
1.36		Y	Y	Y	N	Y
1.75						Y

Coincidences observed (Y) and not observed (N) between γ_b and indicated γ_a

No 0.300 γ, 0.327 γ, 0.428 γ, 0.466 γ
No 2.75 γ (Na^{24} impurity)
(~1.3 β) (1.09 γ) (~1.5 β) (0.56 γ)
(2.1 β) (~0.21 γ, 0.265 γ, 0.365 γ, 0.410 γ)
(1.09 γ) γ delay > 1.6μs

S.B.Burson, W.C.Jordan, J.M.LeBlanc, Phys. Rev. 96, 1555 (1954); 95, 613A (1954).

Se^{73} 34 39 7.1^h

			$Ge^{(70)}$ (30-Mev α,n)	chem
β^+	100†*	1.29 *1*		
	≤1†*	1.65 *1*		sl
γ	29.6**	0.0659 *2*	K/LM = 10.2 M1	sl ce
			$\tau < 5\times10^{-9}$s	$\gamma\gamma$
	1.4**	0.359 *1*	$\tau = 6.0\times10^{-6}$s M2	$\gamma^{\pm}\gamma$

No 0.86 γ, 1.31 γ (< 1%) scin
(0.359 γ)(0.066 γ) $\gamma^{\pm}$(0.066 γ, 0.359 γ)
*6μs delay for ≥ 99% of $\gamma^{\pm}$ (0.066 γ)
**ce per 100 β^+

R.W.Hayward, D.D.Hoppes, Phys. Rev. 98 (1955). BAPS 30, #1(New York), MA2; verbal report.

Rb^{81} 37 44 4.7^h

J	3/2	M
μ	2.00 *6*	

J.P.Hobson, J.C.Hubbs, W.A.Nierenberg, H.B.Silsbee, Phys. Rev. 96, 1450 (1954).

Rb^{86} 37 49 19.5^d

J	2	M
μ	-1.69 *1*	

E.H.Bellamy, K.F.Smith, Phil. Mag. 44, 33 (1953); Nature 168, 556(1951).

Rb^{86} 37 49 19.5^d

Levels Rb^{85}(d,p) E_d = 15.1
g.s. ? Q = 6.2 *3* scin
1.5 ?

N.S.Wall, Phys. Rev. 96, 664 (1954).

Rb^{87} 37 50 6.2×10^{10}y

τ 4.3×10^{10}y GM
Corrections for backscattering and absorption

I.Geese-Bähnisch, E.Huster, Naturwiss. 41, 495 (1954).

Sr 38

Resonance Sr(n,γ) E_n = 0.025 to 500 ev
3.58 ev $\sigma_0\Gamma^2$ = 5.6 to 8.4
mod cyc

E.Melkonian(?)... E.Meservey, Phys. Rev. 96, 1006 (1954); 86, 605A (1952).

Sr^{87} 38 49 2.8^h

γ (0.388) α = 0.28 ic
Authors conclude γ is E5 d 80^hY

I.A.Antonova, I.V.Estulin, Izvest. Akad. Nauk Ser. Fiz. SSSR 18, 79 (1954).

Sr^{89} 38 51 53^d

Levels Sr^{88}(d,p) E_d = 15.1
g.s. Q = 4.29 *15* scin
1.09

N.S.Wall, Phys. Rev. 96, 664 (1954).

Y^{90} 39 51 64.2^h

No nuclear γ (< 10^{-4}%) scin

B.Saraf, J.Varma, C.E.Mandeville, Phys. Rev. 98 (1955). BAPS 30, #1(New York) SP1; priv. comm.

Levels Y^{89}(d,p) E_d = 15.1 scin
g.s. l_n = 2 Q = 4.41 *5*
1.17* l_n = 0 d,p(θ)
*Possibly two unresolved levels

N.S.Wall, Phys. Rev. 96, 664, 670 (1954).

Zr 40

γ		Zr(n,?γ)	E_n = 3.2	scin
0.03†	0.69	0.14†	1.5	
0.40†	0.89	0.44†	2.2	
0.12†	1.14			

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Zr^{90} 40 50 0.83^s

τ_1 0.83^s *3* Zr^{90}(fast n,n')
γ 2.30 *2* E5 scin
Graph of σ from threshold (2.3) to 4.4 shows higher levels feed this metastable state
Comparison with Hauser-Feshbach theory gives best fit for L = 5−*
Not d 15^hNb*

E.C.Campbell, R.W.Peelle, F.C.Maienschein, P.H.Stelson, Phys. Rev. 98 (1955). BAPS,30, #1(New York), MA3; *verbal report.

Zr^{95} 40 55 65^d

Levels Zr^{94}(d,p) E_d = 15.1
g.s. Q = 4.19 5 scin
0.9 2

N.S.Wall, Phys. Rev. 96, 664 (1954).

Zr^{97} 40 57 17.0^h

γ 2% 1.6 Zr^{96}(pile n,γ); scin

B.Saraf, J.Varma, C.E.Mandeville, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), SP1; priv. comm.

Nb 41

Abundances ms
Nb^{93} 100%
All others $< 2\times10^{-4}$%

F.A.White, T.L.Collins, F.M.Rourke, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), N4.

Nb^{93} 41 52 stable

γ Nb^{93}(n,?γ) E_n = 3.2 scin

0.27	0.69
0.53	0.91

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Nb^{97} 41 56 60^s

γ 0.75 d 17^hZr; scin

B.Saraf, J.Varma, C.E.Mandeville, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), SP1; priv. comm.

Nb^{97} 41 56 74^m

γ 0.67 d 60^sNb; scin

B.Saraf, J.Varma, C.E.Mandeville, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), SP1; priv. comm.

Mo 42

γ Mo(n,?γ) E_n = 3.2 scin

0.66†	0.73
0.33†	1.4
0.06†	2.5

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Mo^{93} 42 51 $> 2^y$

Levels Mo^{92}(d,p) E_d = 15.1
g.s. Q = 5.63 5 scin
0.91 10
1.41 10
2.23 10
2.73 10

N.S.Wall, Phys. Rev. 96, 664 (1954).

Mo^{98} 42 56 stable

Levels Mo^{97}(d,p) E_d = 15.1
g.s. Q = 6.06 10 scin
2.5 3

N.S.Wall, Phys. Rev. 96, 664 (1954).

Rh^{106} 45 61 30^s

No delayed $\beta\gamma$ ($\tau_\gamma < 5\times10^{-10}$s)

V.Z.Wintersteiger, Bull. Inst. Nuclear Sci., Boris Kidrich 4, 79 (1954).

Ag 47

γ Ag(n,?γ) E_n = 3.2 scin
0.74
1.10
1.50

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Ag^{108} 47 61 2.3^m

Resonances $Ag^{(107)}$(n) E_n = 10 to 75 ev
E_o(ev) mod cyc
(16.6) $\sigma_o = 2.6\times10^3$
41.8
45.3
51.7
See Ag^{110} for other Ag resonances

G.Grimm, L.J.Rainwater, W.W.Havens, Jr., Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), HA2; verbal report.

Ag^{110} 47 63 24^s

Resonance $Ag^{(109)}$(n,γ) mod cyc
(5.18 ev) $\sigma_o\Gamma^2 = 345 \pm 30$
Assuming $\Gamma_n/\Gamma = 0.11$

E.Melkonian, Phys. Rev. 96, 1006 (1954); 86, 605A (1952).

Resonances $Ag^{(109)}$(n) E_n = 10 to 75 ev
E_o(ev) mod cyc
30.6
40.6
56.1
71.4
See Ag^{108} for other Ag resonances

G.Grimm, L.J.Rainwater, W.W.Havens, Jr., Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), HA2; verbal report.

Cd 48

γ Cd(n,?γ) E_n = 3.2 scin

0.69†	0.57
0.02†	2.8

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Resonances Cd(n,γ) E_n = 0.025 to 500 ev
E_o(ev) mod cyc
0.177 5 Γ = 0.110 5 ev
$\sigma_o = 7.6\times10^3$ 3
~19 $\sigma_o\Gamma \sim 3$
28 $\sigma_o\Gamma^2 = 9$
100
Other unresolved resonances with $E_o > 100$

E.Melkonian, Phys. Rev. 96, 1006 (1954); 86, 605A (1952).

Cd^{111} 48 63 stable

0.247 level — d 2.8^d In

μ −0.783 *28* $\gamma\gamma(\theta,H)$

Measurement independent of quadrupole interaction

R.M.Steffen, W.Zobel, Phys. Rev. 97, 1188 (1955).

0.247 level — Single In crystal

μ −0.725 *47* $\gamma\gamma(\theta,H)$

$|q|$ ~1

H.Albers-Schönberg, E.Heer, T.B.Novey, P.Scherrer, Helv. Phys. Acta 27, 547, 637 (1954).

Cd^{113} 48 65 stable?

Levels — Cd^{112} (d,p) $E_d = 15.1$

g.s. Q = 4.10 *9* scin

0.55 *8*

N.S.Wall, Phys. Rev. 96, 664 (1954).

In^{113} 49 64 1.73^h

γ (0.392) $\alpha = 0.44$ lc

Authors conclude γ is E5 — d 118^dSn

I.A.Antonova, I.V.Estulin, Izvest. Akad. Nauk Ser. Fiz. SSSR 18, 79 (1954).

In^{115} 49 66 4.5^h

γ (0.335) $\alpha = 0.82$ lc

Authors conclude γ is E5 — d 2.3^dCd

I.A.Antonova, I.V.Estulin, Izvest. Akad. Nauk Ser. Fiz. SSSR 18, 79 (1954).

In^{115} 49 66 6×10^{14y}

γ — $In^{(115)}$ (n,?γ) $E_n = 3.2$ scin

0.16†	0.77	0.10†	1.15
0.27†	0.88	0.16†	2.1

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Sn 50

γ — Sn(n,?γ) $E_n = 3.2$ scin

0.14†	0.69
1.67†	1.14
0.21†	2.0

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Sn^{125} 50 75 9.5^m

Levels — Sn^{124} (d,p) $E_d = 15.1$

g.s Q = 3.52 *7* scin

1.16 *8*

2.77 *10*

3.41 *10*

4.09 *10*

N.S.Wall, Phys. Rev. 96, 664 (1954).

Sb^{116} 51 65 60^m

τ_1 — 60^m $In^{(115)}$ (26-Mev α,3n) chem

γ 15† 0.41 *2* scin

130† 0.95 *5*

150† 1.31 *5*

Yield 15.5^mSb/60^mSb ~const. for $E_\alpha = 26$ to 52

†Photons per 100 β^+

A.H.W.Aten, Jr., J.Manassen, G.D.de Feyfer, Physica 20, 665 (1954).

Sb^{116} 51 65 15.5^m

τ_2 — 14^m $In^{(115)}$ (26-Mev α,3n) chem

β^+ 2.4 *2* a

γ 2.2 *1* scin

Lower energy γ's probably present

Yield 15.5^mSb/60^mSb~const. for $E_\alpha = 26$ to 52

A.H.W.Aten, Jr., J.Manassen, G.D.de Feyfer, Physica 20, 665 (1954).

Sb^{120} 51 69 5.8^d

τ_1 — 5.8^d *2* Sn^{119} (15-Mev d,n) chem

γ 1770* 0.090 *1* K/LM = 8.3 E1 sl ce

1000* 0.200 *1* K/LM = 4.6 E2

10.4* 1.035 *5* E2

7.8* 1.180 *5* E2

(0.09γ)(0.20γ)(θ) $\Delta J = 1$(D),2(Q) scin

(0.20γ)(1.04 + 1.18γ)(θ) $\Delta J = 2$(Q),2(Q)

(1.04γ)(1.18γ)(θ) J = 4, 2, 0

x(0.09γ, 0.20γ, 1.04 + 1.18γ) delay = 11μs**

Not p 16.4^mSb (β^+< 0.3%) scin

*Relative intensity ce

C.L.McGinnis, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), WA5; **verbal report.

Sb^{120} 51 69 16.4^m

γ 1.18 scin

$(1.18\gamma)/\beta^+ = 0.03$ — $Sb^{(121)}$ ($\leq$50-Mev γ,n)

C.L.McGinnis, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), WA5.

Sb^{122} 51 71 2.75^d

β 12% 0.72 *2* $Sb^{(121)}$ (pile n,γ); sl

7% 0.90 *5*

60% 1.41 *1* F-K plot linear

21% 1.97 *1* $\Delta J = 2$,yes shape

γ 0.558 sl pe

0.687

(1.41β, ~0.90β)γ sl

(0.90β, 0.72β)(1.1-1.2γ)

($E_\beta = 0.3$)(0.56γ, 0.69γ)

($E_\beta = 1.1$)(0.56γ); no ($E_\beta = 1.1$)(0.69γ)

J.Moreau, Compt. rend. 239, 1130 (1954).

Te 52

γ — Te(n,?γ) $E_n = 3.2$ scin

0.72	1.43
1.10	2.3

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

I^{127} 53 74 stable

Level $I^{127}(n,n'\gamma)$ $E_n = 0.2$ to 2
γ (0.20)
Yield indicates direct decay to g.s.

J.B.Guernsey, A.Wattenberg, Phys. Rev. 98 (1955). BAPS 30, #1(New York), A1; verbal report.

γ $Ir^{127}(n,n'\gamma)$ $E_n = 3.2$ scin

	0.21	st	0.63
	0.33		1.04 ?
st	0.42		

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Cs^{126} 55 71 1.6^m

τ	1.6^m 2	d 96^mBa chem; ms
β^+	3.8 4	a, scin
γ	0.385 5	scin

No 0.48 γ(< 10% of 0.385 γ)
No γ with $E_\gamma > 0.6$(< 13% of 0.385 γ)
$\beta^+ : x : \gamma = 82 : 18 : 38$
(0.385 γ)($\gamma^\pm$, << 3-Mev β^+)
No (0.385 γ) (3.8 β^+)

M.I.Kalkstein, J.M.Hollander, Phys. Rev. 96, 730 (1954).

Cs^{131} 55 76 10^d

J	5/2	M
μ	+3.48 4	

E.H.Bellamy, K.F.Smith, Phil. Mag. 44, 33 (1953).

Cs^{134} 55 79 2.3^y

J	4	M
μ	+2.95 1	

E.H.Bellamy, K.F.Smith, Phil. Mag. 44, 33 (1953).

β^- 25% 0.088 4 Cs^{133}(slow n,γ); s
75% 0.654 6

			α	K/LM
γ	10†	0.563 2	0.004	
	18†	0.569 2	0.006	
	100†	0.604 2		7.0
	100†	0.796 3		8.4
	8†	0.802 3	0.0026	
	1.1†	1.038 4?	0.002	7.6
	1.7†	1.166 4?	0.0015	8.4
	2.8†	1.367 4	0.0014	10.0

No β^+ (< 0.1%)

A.A.Bashilov, N.M.Anton'eva, M.V.Blinov, B.S.Dzhelepov, Izvest. Akad. Nauk Ser. Fiz. SSSR 18, 43 (1954).

Cs^{134} 55 79 2.3^y

γ	4†	0.2004 15		sd ce,pc
	4†	0.2083 15		
	4†	0.4753 30		
	15†	0.5652 7		
	20†	0.5709 7		
	100†	0.6058 7	K/L = 6.3	
	2†	0.6618 20		
	100†	0.7970 6	K/L = 8.0	
	15†	0.8022 6		
	4†	1.0345 30		
	4†	1.168 3		
	4†	1.370 3		

J.Verhaeghe, J.Demuynck, Compt. rend. 239, 1374 (1954).

γ	3.5†	0.467 15	sl pe
		0.553 7	
	21†	0.571 7	
	100†	0.607 5	
	100†	0.794 3	
		1.027 15	
	4†	1.164 10	
	5.3†	1.368 5	
		1.401 15	

M.C.Joshi, B.V.Thosar, Phys. Rev. 96, 1022 (1954).

γ sum peaks 1.175 Σ scin
1.400
1.972

D.C.Lu, M.L.Wiedenbeck, Phys. Rev. 94, 501 (1954).

No delayed $\beta\gamma$ ($\tau_\gamma < 5\times10^{-10s}$)

V.Z.Wintersteiger, Bull. Inst. Nuclear Sci., Boris Kidrich 4, 79 (1954).

Ba 56

γ Ba(n,?γ) $E_n = 3.2$ scin

st	0.47		1.19
	0.60	st	1.41
	0.78		1.51
	1.06		2.1

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Resonances Ba(n,γ) $E_n = 0.025$ to 500 ev mod cyc

E_o(ev)	$\sigma_o\Gamma^2$
25	8
93	90
380	550

E.Melkonian, Phys. Rev. 96, 1006 (1954); 86, 605A (1952).

Ba^{124}? 56 68
τ ~12^m $\mathrm{In}^{(115)}$ (140-Mev N^{14},5n) chem
Possibly Ba^{127} but 6.3^h Cs^{127} not detected

M.I.Kalkstein, J.M.Hollander, Phys. Rev. 96, 730 (1954).

Ba^{126} 56 70 96^m
τ 96.5^m *2.0* D 1.6^mCs chem
$\mathrm{In}^{(115)}$ (140-Mev N^{14},3n)
γ 100† 0.225 *10* scin
33† 0.700 *30*
w 0.9 ?
x st K x ray
(0.225 γ) (0.70 γ)?

M.I.Kalkstein, J.M.Hollander, Phys. Rev. 96, 730 (1954).

Ba^{127}? 56 71
τ ~12^m $\mathrm{In}^{(115)}$ (140-Mev N^{14},2n) chem
6.3^h Cs^{127} not detected, activity probably Ba^{124}

M.I.Kalkstein, J.M.Hollander, Phys. Rev. 96, 730 (1954).

Ba^{137} 56 81 2.60^m
γ (0.662) d 33^yCs; sd ce
K : L : LM : MN = 52 : 10 : 13 : 2.8

J.Verhaeghe, J.Demuynck, Compt. rend. 239, 1374 (1954).

La^{140} 57 83 40.2^h
τ 40.5^h *6*
β⁻ 16% 0.42 *4* s
12% 0.86 *3*
20% 1.15 *3*
30% 1.36 *2*
14% 1.62 *2*
8% 2.20 *2*
γ 1.3* 0.331 *2* K : L : M = 100 : 14 : 6
0.46* 0.486 *3* K : L : M = 32 : 8 : 4
0.10* 0.810 *3*
0.14* 1.60 *1* K : L = 11 : 2
*ce per 100 β⁻

A.A.Bashilov, B.S.Dzhelepov, L.S.Chervinskaya, Izvest. Akad. Nauk Ser. Fiz. SSSR 18,88(1954).

Ce 58
γ Ce (n, ?γ) E_n = 3.2 scin
0.48 1.50
0.90 2.5

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Ce^{139} 58 81 140^d
$\mathrm{La}^{(139)}$ (11-Mev d,2n) chem
γ 0.1665 α_K = 0.20 sπ ce, scin
K : L : MN = 82 : 10 : 2.5 M1
No harder γ (< 0.1%) No other ce
No β⁺
K x ray/0.166γ = 1.0 ± 0.2 scin
e_A/ce_K = 0.34 sπ
ϵ_K/ce_K = 4.4 ± 0.2 (xγ/γ)/(xx/x)
(K x ray) (0.166γ) delay < 10^{-8} s scin
E_ϵ ≤ 0.15 (to 0.166 level) from coincidence and single counting rates

C.M.Pruett, R.G.Wilkinson, Phys. Rev. 96, 1340; 95, 625A (1954).

Ce^{143} 58 85 33^h
Levels Ce^{142} (d,p) E_d = 15.1
g.s. Q = 2.86 *7* scin
0.90 *15*

N.S.Wall, Phys. Rev. 96, 664 (1954).

Ce^{144} 58 86 290^d
β⁻ 20% 0.180 *15* U(n,f)chem; sd
~5% 0.258 *15*
75% 0.327 *7*
γ 0.0334 sπ ce
0.0408
0.0532
0.0590 K/L < 1 No L_2
0.0798
K : L_1 : L_3 = 345 : 100 : ~15
0.0950
0.1335
K : L_1 : L_2 : L_3 = 53 : 10 : 0 : ~1
0.1452

No 0.0468γ, 0.0603γ, 0.100γ, 0.231γ
(0.134γ)(0.033γ, 0.041γ)
(0.080γ)(0.041γ, 0.145γ?)

J.M.Cork, M.K.Brice, L.C.Schmid, Phys. Rev. 96, 1295 (1954).

γ 29† (0.081) Σ scin
100† (0.134)

W.E.Kreger, C.S.Cook, Phys. Rev. 96, 1276 (1954).

Pr^{135} 59 76 22^m
τ 22^m D 22^hCe
Ce^{136} (22-Mev p,2n) chem
Not by Ce^{136} (9.5-Mev p,n)
β⁺ 2.5 *1* a,scin
γ 0.080 scin
0.22
0.30

T.H.Handley, E.L.Olson, Phys. Rev. 96, 1003 (1954).

Pr^{136} 59 77, 70^m

τ	70^m	Ce^{136}(9.5-Mev p,n)	chem
β^+	2.0 *1*		a,scin
γ	0.17		scin
	~0.8 ?		
	~1.1 ?		

T.H.Handley, E.L.Olson, Phys. Rev. 96, 1003 (1954).

Pr^{137} 59 78

τ	$>1^y$ or $<5^m$		scin
No 1.4^h activity		Ce^{138}(22-Mev p)	chem

T.H.Handley, E.L.Olson, Phys. Rev. 96, 1003 (1954).

Pr^{138} 59 79, 2.0^h

τ	2.0 *1*	Ce^{138}(9.5-Mev p,n)	chem
β^+	1.4 *1*		a,scin
γ	0.30	~1.4 ?	scin
	0.80	~1.7 ?	
	1.05		

T.H.Handley, E.L.Olson, Phys. Rev. 96, 1003 (1954).

Pr^{139} 59 80, 4.5^h

Nd^{142}(18-Mev p,α) $Ce^{(140)}$(fast p,2n)

τ	4.5^h	p 140^dCe	chem
β^+	1.0 *1*		a,scin
γ	0.17	in 140^dCe?	scin
	1.3		
	1.6		

T.H.Handley, E.L.Olson, Phys. Rev. 96, 1003 (1954).

Pr^{140} 59 81, 3.5^m

τ	3.4^m	Pr^{141}(22-Mev p,pn)	chem
		$Ce^{(140)}$(9.5-Mev p,n)	chem

T.H.Handley, E.L.Olson, Phys. Rev. 96, 1003 (1954).

Pr^{142} 59 83, 19.2^h

γ	1.6	Pr^{141}(pile n,γ);	scin
No other γ			

B.Saraf, J.Varma, C.E.Mandeville, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), SP1.

Levels	Pr^{141}(d,p)	E_d = 15.1	
	g.s.	Q = 3.42 *30*	scin
	0.62 *10*		

N.S.Wall, Phys. Rev. 96, 664 (1954).

Pr^{143} 59 84, 13.8^d

No γ ($<10^{-3}$%)	scin

B.Saraf, J.Varma, C.E.Mandeville, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), SP1.

Pr^{144} 59 85, 17.5^m

β^-	1.5%	0.82	U(n,f) chem; sd
	98.5%	3.12	
γ		0.688	scin
		1.49	
		2.18	
No 0.0603γ			sr ce

J.M.Cork, M.K.Brice, L.C.Schmid, Phys. Rev. 96, 1295 (1954).

γ	12†	(0.695)	d 290^dCe; scin
	2.3†	(1.48)	
	5.9†	(2.18)	

†Photons per 100 Ce^{144} 0.134 photons

W.E.Kreger, C.S.Cook, Phys. Rev. 96, 855A, 1276 (1954).

Nd 60

Resonance	Nd(n)	E_n = 0.07 to 20 ev	cryst
	E_o(ev)	$\sigma_o\Gamma^2$	
	4.38 *4*	1-10	

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954).

Nd^{143} 60 83, stable

μ	-1.1 *1*	Enriched Nd^{143}	S

K.Murakawa, Phys. Rev. 96, 1543 (1954).

Levels	Nd^{142}(d,p)	E_d = 15.1	
	g.s.	Q = 3.79 *8*	scin
	0.70 *10*		

N.S.Wall, Phys. Rev. 96, 664 (1954).

Nd^{145} 60 85, stable

μ	-0.69 *10*	Enriched Nd^{145}	S

K.Murakawa, Phys. Rev. 96, 1543 (1954).

Nd^{150} 60 90, $>10^{15}$y

τ_β	$>10^{16}$y	pc

No β's with $0.006 < E_\beta < 0.3$ from 1.18g natural Nd(2.1 mg/cm²)

D.Dixon, A.McNair, Phil. Mag. 45, 1099(1954).

Pm^{149} 61 88, 50^h

		Nd^{150}(9-Mev p,2n)	chem
β^-	0.97		s
γ	0.285		scin
	~1.0		

V.K.Fischer, Phys. Rev. 96, 1549 (1954).

Pm^{150} 61 89 2.7^h

τ		2.7^h	Nd^{150}(9-Mev p,n)	chem
β^-	~80%	2.01 *5*		sd
	~20%	3.05 *5*		

γ	100†	0.34 *1*		1.24?	scin
		0.39?	4†	1.32 *5*	
	20†	0.43 *2*	0.8†	1.67 *5*	
	40†	0.82 *2*	0.4†	2.0 *1*	
		0.96?	0.8†	2.6 *1*	
	4†	1.17 *5*	0.4†	3.0 *1*	

(E_β = 2) (0.34, 0.43, 0.82, 1.17γ's) scin
(E_β = 2) (1.32, 1.67, <2.5 γ's)
(E_β = 3) (0.39?, 0.82, 1.24?, 1.32 γ's)
(0.34 γ)(0.39?, 0.43, 0.82, 1.32, 1.67, <2.0γ's)
Decay scheme proposed

V.K.Fischer, Phys. Rev. 96, 1549; 95, 626A (1954).

Sm 62

Resonances Sm(n) E_n = 0.07 to ~22 ev cryst

E_o (ev)		$\sigma_o\Gamma^2$*	Isotope**
0.0976	*5*	68	150
0.871	*5*	10-50	150
3.43	*2*	1-10	148
4.98	*5*	1-10	150
6.45	*10*	1-10	150 ?
8.2	*1*	> 100	153
9.1	*2*	1-10	150 ?
12.0	*5*	1-10	
15.2	*5*	1-10	150 ?
17.2	*5*	1-10	150 ?
19.1	*5*	50-100	148
27.1	*5*	50-100	151

*For natural Sm **Enriched samples used

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 89, 904A (1953).

Sm^{148} 62 86 stable

Resonances Sm^{147}(n) E_n = 0.07 to ~22 ev cryst

E_o (ev)		$\sigma_o\Gamma^2$
3.43	*2*	10-50
19.1	*5*	> 100

See also Sm

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 89, 904A (1953).

Sm^{150} 62 88 stable

Resonances Sm^{149}(n) E_n = 0.07 to ~22 ev cryst

E_o (ev)		$\sigma_o\Gamma^2$
0.0976	*5*	490
0.871	*5*	>100
4.98	*5*	10-50
6.45	*10**	10-50
9.1	*2**	10-50
15.2	*5**	10-50
17.2	*5**	10-50

*Assignment uncertain See also Sm

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 89, 904A (1953).

Sm^{151} 62 89 ~70^y

Resonance Sm^{150}(n) E_n = 0.07 to ~22 ev cryst

E_o (ev)		$\sigma_o\Gamma^2$
21.1	*5*	>100

See also Sm

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 89, 904A (1953).

Sm^{153} 62 91 47^h

β^-	67-45†	0.710	sl β(0.103γ)
	33-55†	0.640	sl β(0.103γ)

N.Marty, J. Phys. radium 15, 605 (1954).

β^-**	32%*	0.640 *15*		sl
	49%*	0.710 *15*		
	19%*	0.810 *10*		
γ	100†*	0.0690 *4*	α = 6, K/L > 4.6	sl ce, scin
		0.1025 *5*	K/L > 6.1, τ = 4.0x10^{-9}*	β(ce)
	0.033†*	0.1716	K/L = 4.5*, τ = 1.4x10^{-10}*	β(ce)
	w	0.520		

(0.64 β) (0.1025 γ) (0.71 β) (0.069 γ)
†ce per 100 β^-
**Spectrum analyzed only for E_β > 0.35

R.L.Graham, J.Walker, Phys. Rev. 94, 794A (1954); *priv. comm.

Resonance Sm^{152}(n) E_n = 0.07 to ~22 ev cryst

E_o (ev)		$\sigma_o\Gamma^2$
8.2	*1*	> 100

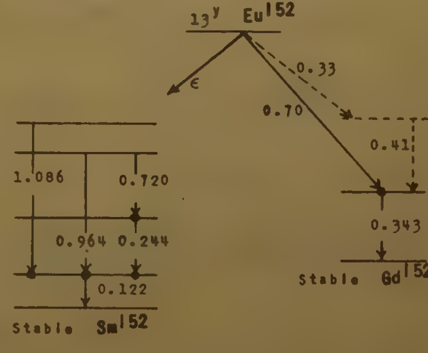
See also Sm

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 89, 904A (1953).

Eu^{152} 63 89 13^y

β^-	0.38 *10?*			$Eu^{152,154}$ source; sl
	0.70 *3*			$\beta\gamma$
γ	(0.122)* sl ce		0.41 ?	scin
	(0.244)* sl ce		(0.720)	scin
	(0.343)* sl ce		(0.964)	scin
			(1.086)	scin

No 0.336 γ
(0.70 β) (ce$_K$ 0.343 γ) sl
No β(ce$_L$ 0.122 γ, ce$_K$ 0.244 γ) sl
(ce 0.122 γ) (ce 0.244 γ, no ce 0.123 γ) sl
(x ray) (0.122 γ, 0.244 γ, 0.964 γ?) Σ scin
Sum peaks also at ~1.14? ~1.26 Σ scin
No (0.343 γ) (x ray, γ) Σ scin
*Assignment from ms results of Katz, Lee



R.E.Slattery, D.C.Lu, M.L.Wiedenbeck, Phys. Rev. 96, 465 (1954).

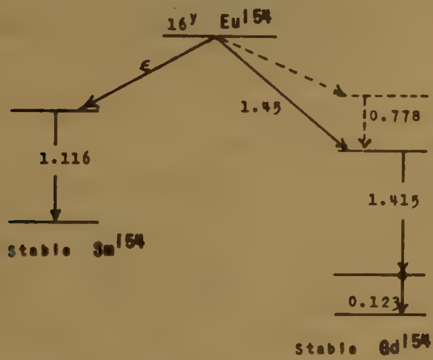
Eu^{152} 63 89, 13^y

Resonance $Eu^{(151)}(n)$ $E_n = 0.001$ to 0.01 ev
-0.0006 ev $\sigma_o = 8.4\times10^4$ cryst
$\Gamma_\gamma = 0.067$

N.Holt, Phys. Rev. 98 (1955)
BAPS 30, #1(New York), HA11.

Eu^{154} 63 91, 16^y

β^- 1.45 *5* $Eu^{152,154}$ source; sl
γ (0.123)* (1.116)* scin
(0.778) ? 1.415**
No 0.336 γ
(1.415 γ)(x ray, 0.123 γ) Σ scin
No (0.123 γ)(x ray) Σ scin
No (0.778 γ)(x ray, γ) Σ scin
No (ce_L 0.123 γ)β sl
*Assignment from ms results of Katz, Lee
**Assignment from coincidences



R.E.Slattery, D.C.Lu, W.L.Wiedenbeck, Phys. Rev. 96, 465 (1954).

Gd 64

Resonances Gd(n) $E_n = 0.07$ to ~ 35 ev

E_o(ev)	$\sigma_o\Gamma^2$	cryst
2.01 *1*	1–10	
2.57 *2*	10–50	
2.81 *3*	1–10	
6.33 *6*	10–50	
7.8 *1*	1–10	
11.9 *2*		
16.9 *4*		
21.1 *5*		
22.5 *6*		
30.8 *8*		
34.0 *10*		

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954).

Gd^{155} 64 91, stable

J $\geq 5/2$ s
μ -0.19 *5* assuming J = 7/2

K.Murakawa, Phys. Rev. 96, 1543 (1954).

Gd^{157} 64 93, stable

J $\geq 5/2$ s
μ -0.33 *6* assuming J = 7/2

K.Murakawa, Phys. Rev. 96, 1543 (1954).

Tb^{160} 65 95, 73^d

τ 72.3^d *5*
β^- 19% 0.28 *4* 32% 0.557 *15* s
19% 0.46 *2* 30% 0.851 *10*

γ s ce,pe

0.064	0.297	
0.0862	0.391	0.962
0.093	0.411	0.976
0.156	0.466	1.034
0.181	0.569	1.110
0.196	0.679	1.173
0.274	0.762	1.196
0.234	0.856	1.250
0.274	0.876	1.266
0.282	0.915	1.447

(ce_L 0.086γ)(ce_K 0.196γ, ce_K 0.297γ) s ce
The above 29 most intense γ's (out of 70γ's found) fitted into 8 levels

V.Keshishian, H.W.Kruse, R.J.Klotz, C.M.Fowler, Phys. Rev. 96, 1050 (1954).

Resonances $Tb^{159}(n)$ $E_n = 0.07$ to 13 ev

E_o(ev)	$\sigma_o\Gamma^2$	cryst
3.37 *3*	10–50	
5.4 *2 ?*	1–10	
10.6 *3*	10–50	
11.4 *2*	50–100	

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954).

Dy 66

Resonances Dy(n) $E_n = 0.07$ to ~ 80 ev

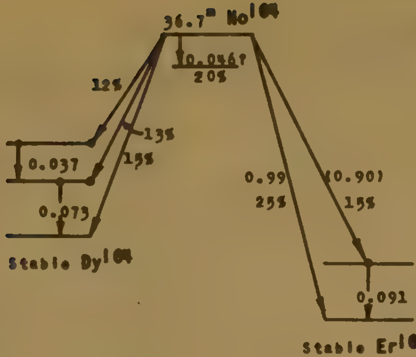
E_o(ev)	$\sigma_o\Gamma^2$	cryst
1.72 *1*	10–50	
2.73 *2*	1–10	
3.70 *3*	1–10	
4.36 *5*	1–10	
5.49 *4*	> 100	
7.8 *2*		
9.9 *5*	< 1	
10.6 *15*	10–50	
13.5 *5*		
16.8 *3*		
19.7 *5*		
74 *15*	50–100	

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 91, 450A (1953).

Ho^{164} 67 97, 36.7^m

τ 36.7^m *5* Ho^{165}($\leq$ 22-Mev γ,n)
β^- 38† (0.90)
62† 0.99 *3* sd
No β^+ (< 0.08†) scin
γ 3.6† 0.0373 *5* $a_L \sim 10$ pc,sd ce
0.046 IT* ?
3.3† 0.0728 *5* $a_K = 2.7$ E2 xx/xy
$\tau = 1.4\times10^{-9s}$? xy
3.5† 0.0905 *5* $a_K = 1.9$ E2 βx/$\beta\gamma$
$\tau = 1.4\times10^{-9s}$ $\beta\gamma$
x 90† K x ray + 0.046γ
No Ho K x ray (< 27†) No Er K x ray (< 18†)
(β)(ce 0.091γ) No (β)(ce 0.046γ) sd
(β)(x ray)/(β)(0.091γ) = 1.8
(x ray)(0.037γ, 0.073γ)
No (0.037γ)(0.073γ)
Assignment to IT based on:
$\epsilon_K/\beta = 0.9 \pm 0.2$ from $x/\beta = 0.9 \pm 0.2$
(< 0.164-Mev pulses)/$\beta = 1.30 \pm 0.15$ Σ scin

Ho^{164}
67 97



H.N.Brown, R.A.Becker, Phys. Rev. 96, 1372 (1954); 95, 626A (1954).

Ho^{166}
67 99
27.3^h

β^-	0.76%	0.393		sl $\beta\gamma$
	47.6%	1.771 *7*	$\Delta J = 2$, yes shape	sl $\beta\gamma$
	51.6%	1.854 *5*	F-K plot linear	sl
γ		0.0803 *2*	$\alpha_K = 1.9$ E2	sl ce
			K : L : MN = 10 : 25 : 7	
	0.76%	1.380	$\alpha_K = 1.7\times10^{-3}$ E2	

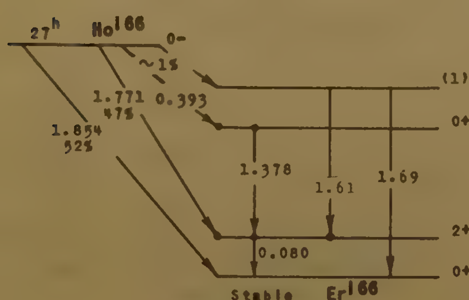
No 0.184γ ($ce_K < 10^{-3}$%)
(1.77β)(0.080γ, ce_L 0.080γ) delay = 1.8×10^{-9}s
(1.77β)(0.080γ)(θ) J = 0, 2, 0 assuming same attenuation as for $\gamma\gamma(\theta)$

R.L.Graham, J.L.Wolfson, M.A.Clark, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), MA11; verbal report.

γ	0.080	scin
	1.378 *7*	
	1.61 *2*	
	1.69 *2*	

(0.080γ)(1.38γ)(θ) J = 0, 2, 0
(0.080γ)(1.61γ)(θ) J = 1, 2, 0
No (0.080γ)(1.69γ)
Attenuation of $\gamma\gamma(\theta)$ coefficients shows quadrupole interaction

J.S.Fraser, J.C.D.Milton, Phys. Rev. 98(1955). Proc. Roy. Soc. Canada 48, 12A (1954). BAPS 30, #1 (New York), MA10.



R.L.Graham, J.L.Wolfson, M.A.Clark, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), MA11; verbal report.

Ho^{166}
67 99
$>30^y$

γ	0.0803 *2*	sl ce
	0.1841 *10*	
	0.282 *4*	

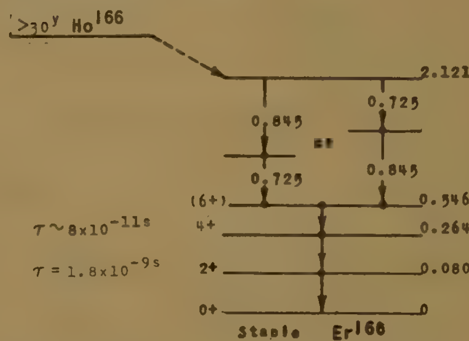
(0.080γ)(0.184γ) delay = $18.2\pm0.6\times10^{-10}$s
(0.184γ)(0.282γ) delay = $8\pm5\times10^{-11}$s scin
g.s. and first 3 excited states form a rotational band (from energy spacing)

R.L.Graham, M.A.Clark, Phys. Rev. 98 (1955); quoted by Milton, Fraser, Milton.
BAPS 30, #1 (New York), MA12; verbal report.

Ho^{165}(pile n,γ) chem scin

γ	1†	0.080	
	~1†	0.188 *5*	
	~1†	0.283 *10*	
	~1†	0.725 *20*	
	~1†	0.845 *20*	

(0.080γ)(0.188γ)(θ) J = 4, 2, 0*
All 5 γ's in cascade $\gamma\gamma$ scin
(0.725γ, 0.845γ)(most of the x rays)*
Delay 0.264 level ~8×10^{-11}s*
No $\beta\gamma$ delay ($<2\times10^{-9}$s)



J.C.D.Milton, J.S.Fraser, G.M.Milton, Phys. Rev. 98 (1955).
BAPS 30, #1(New York), MA12; *verbal report.

Er
68

Resonances Er(n) E_n = 0.07 to ~30 ev cryst

E_0 (ev)	$\sigma_0\Gamma^2$
0.47 *1*	10-50
0.58 *1*	10-50
6.10 *6*	50-100
9.62 *9*	10-50
16.2 *2*	10-50
21.2 *3*	
27.5 *4*	

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 90, 362A (1953).

Tm^{169}
69 100
stable

J	1/2	S
μ	-0.20 *3*	

Shell model predicts even parity but μ agrees with $p_{1/2}$ Schmidt limit

K.H.Lindenberger, A.Steudel, Naturwiss. 42, 41 (1955).

$_{70}$Yb

Resonances Yb(n) E_n = 0.07 to 20 ev cryst

E_o (ev)	$\sigma_o\Gamma^2$**
0.597 1*	1.28 ± 0.10
4.551 3	< 1
8.09 8	1-10
13.30 14	1-10
18.2 2	1-10

*Assigned to A = 169 **For natural Yb

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 89, 904A (1953).

Yb^{169}
70 99
31.8^d

Resonance $Yb^{(168)}$(n) E_n = 0.07 to 20 ev cryst

E_o (ev)	$\sigma_o\Gamma^2$
0.597 1	995 ± 90

See also Yb

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 89, 904A (1953).

$_{71}$Lu

Resonances Lu(n) E_n = 0.07 to ~21 ev cryst

E_o (ev)	$\sigma_o\Gamma^2$*	Isotope
0.142 1	1.4 ± 0.3	177
1.57 1	< 1	177
2.62 2	1-10	177
4.80 4	1-10	177 ?
5.30 5	10-50	176
11.4 2	10-50	176
14.4 3		176
20.6 5		176 ?

*For natural Lu

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 92, 656 (1953); 90, 362A (1953).

Lu^{176}
71 105
2.4x10^{10y}

Resonances $Lu^{(175)}$(n) E_n = 0.07 to ~21 ev cryst

E_o (ev)	$\sigma_o\Gamma^2$
5.30 5	10-50
11.4 2	10-50
14.4 3	
20.6* 5	

*Assignment uncertain

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 92, 656 (1953); 90, 362A (1953).

Lu^{177}
71 106
6.8^d

Resonances $Lu^{(176)}$(n) E_n = 0.07 to ~21 ev cryst

E_o (ev)	$\sigma_o\Gamma^2$
0.142 1	54 ± 12
1.57 1	10-50
2.62 2	> 100
4.80* 4	> 100

*Assignment uncertain

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 96, 1014 (1954); 92, 656 (1953); 90, 362A (1953).

Ta^{181}
73 108
stable

γ Ta^{181}(n,?γ) E_n = 3.2 scin

1.26†	0.46
0.93†	1.4

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

W
74

Abundances ms

W^{185}	< 0.0002%
W^{187}	< 0.0001%

F.A.White, T.L.Collins, F.M.Rourke, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), N4.

Re^{185}
75 110
stable

J 5/2 Mic
$Q(Re^{185})/Q(Re^{187})$ = 1.07 ± 0.05

A.Javan, A.Engelbrecht, Phys. Rev. 96, 649 (1954); 91, 222A (1953).

Re^{187}
75 112
?

J 5/2 Mic
$Q(Re^{185})/Q(Re^{187})$ = 1.07 ± 0.05

A.Javan, A.Engelbrecht, Phys. Rev. 96, 649 (1954); 91, 222A (1953).

τ > 10^{16y} PC
No β with E_β > 0.001
L x rays observed from Re, Os, Pt, W believed produced by background γ's

D.Dixon, A.McNair, Phil. Mag. 45, 1099 (1954).

Re^{188}
75 113
16.9^h

τ_2 16.7^h 5 $W^{(186)}$(slow n) chem
β^- 2.01 s

B.S.Dzhelepov, N.D.Novosil'tseva, P.A.Tishkin, Izvest. Akad. Nauk Ser. Fiz. SSSR 18, 76 (1954).

Os^{187}
76 111
stable

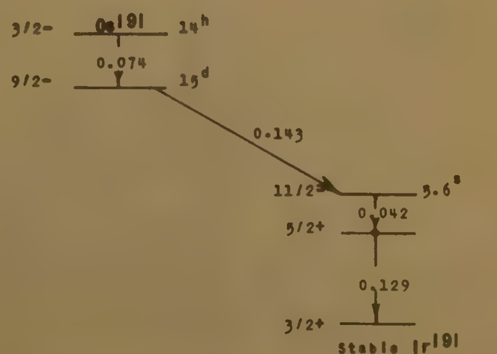
τ_ϵ > 10^{15y} PC
L x rays observed from Re, Os, Pt, W believed produced by background γ's

D.Dixon, A.McNair, Phil. Mag. 45, 1099 (1954).

Os^{191}
76 115
14^h

γ 0.0742 E4 1-2% M3 ~ 98%
$L_1 : L_2 : L_3$ = 55 : 15 : 100

No β^- (< 5%)



J.W.Mihelich, M.Goldhaber, Phys. Rev. 98 (1955).
BAPS 30, #1 (New York), S1; verbal report.

Ir^{191} 77 114 5.6^{s}

τ_1	5.6^{s} *4*	d 15^{d}Os	chem
γ	(0.042)		
	(0.129)		

R.A.Naumann, J.S.Gebhart, Phys. Rev. 96, 1452 (1954).

τ_1	6.8^{s} *1*	Ir^{191}(fast n,n'γ)	
γ	(0.042)		
	(0.129)	$\tau < 5\times10^{-10s}$*	scin

J.W.Mihelich, M.McKeown, M.Goldhaber, Phys. Rev. 96, 1450(1954); *A.W.Sunyar, ibid.

Ir^{192} 77 115 1.42^{m}

τ_1	1.42^{m}	$Ir^{(191)}$(pile n,γ)	
γ	0.0580 *4*	$L_2/L_3 = 1.1$	s7 ce
		$\alpha_L \gtrsim 870$ E3	scin

No $\gamma\gamma$ (< 1% of count expected for 2 quantum decay)

Continuum ≤ 50 kev attributed to bremsstrahlung (< 0.01 quantum/ce)

J.P.Mize, M.E.Bunker, J.W.Starner, Phys. Rev. 96, 444; 95, 627A (1954).

Ir^{192} 77 115 74.4^{d}

β^- 0.672 $Ir^{(191)}$(pile n,γ); sl

γ 2.6†	0.1362 *3*	57†	0.4678 *1*	sl pe
0.8†	0.1740 *4*	5.2†	0.4844 *2*	
0.8†	0.2012 *3*	6.4†	0.5887 *3*	
3.5†	0.2054 *2*	10†	0.6045 *3*	
1.0†	0.2815 *5*	7.7†	0.6127 *2*	
26†	0.2958 *1*	0.06†	0.745 *3*	
28†	0.3084 *1*	0.06†	0.783 *2*	
77†	0.3165 *1*	0.9†	0.8854 *10*	
0.5†	0.374 *2*	0.15†	1.065 *2*	
0.5†	0.440 *2*	0.08†	1.157 *2*	

M.W.Johns, S.V.Nablo, Phys. Rev. 96,1599(1954)

Ir^{194} 77 117 19^{h}

β^-	~8%	0.430	$Ir^{(193)}$(pile n,γ); sl
	9.7%	0.975	
	15%	1.905	
	66%	2.236 *10*	

γ 5.1†	0.2930 *3*	0.3†	1.339 *2*	sl pe
27†	0.3281 *2*	0.6†	1.466 *1*	
< 3†	0.466	0.2†	1.478 *1*	
1.7†	0.6200 *10*	0.3†	1.507 *2*	
6.2†	0.6433 *6*	0.3†	1.618 *2*	
2.9†	0.9374 *4*	0.2†	1.662 *3*	
2.9†	1.1492 *6*	0.3†	1.802 *2*	
1.7†	1.180 *1*	0.05†	2.048 *4*	
0.4†	1.216 *1*			

M.W.Johns, S.V.Nablo, Phys. Rev. 96, 1599 (1954).

Au^{192} 79 113 4.8^{h}

τ 4.8^{h} Au^{197}(p) Hg(p) chem

γ 0.1365	0.401	s ce
0.1577	0.4155	
0.1734	0.4355	
0.2054	0.467	
0.2818	0.588	
0.2957	0.612	
0.3081	0.783	
0.3160	1.158	

G.T.Ewan, A.L.Thompson, Proc. Roy. Soc. Canada 47, 126A (1953); and quoted by M.W.Johns, S.V.Nablo, Phys. Rev. 96, 1599 (1954).

Au^{195} 79 116 185^{d}

$Pt^{(196)}$(28-Mev d,3n) chem

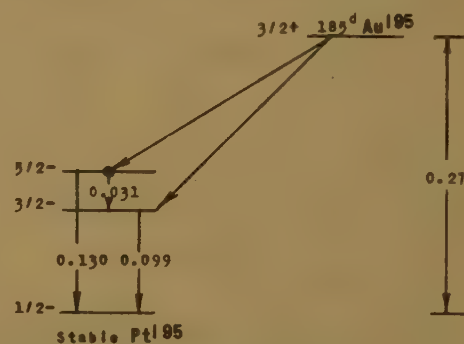
γ	1.4†	(0.031) $\alpha = 32$ M1	pc
	14†	(0.099)	
x	41†	L x ray	
	100†	K x ray	

(L x ray) (L x ray, 0.031 γ)

ϵ_L/ϵ_K (to 0.130 level) = 0.58 ± 0.14

$E_{dis} = 0.14 + 0.13$ (E_γ)

Data indicate little if any ϵ to Pt^{195} g.s.



A.Bisi, L.Zappa, Nuovo Cim. 12, 539 (1954).

Au^{197} 79 118 stable

Levels Au^{197}(p,p'γ) E_p = 2.0 to 5.0

0.279 Level J = 5/2+ p,$\gamma(\theta)$

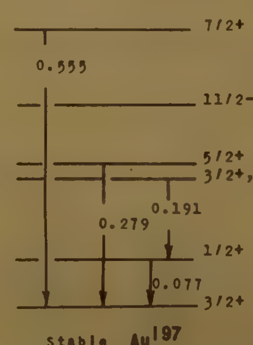
γ 0.279 E2/M1 ~ 0.7

0.555 Level J = 7/2+ p,$\gamma(\theta)$

γ 0.555

No 0.276 γ (< 5% of 0.555 γ) from no (0.279γ)γ

No 0.478 γ



C.F.Cook, C.M.Class, J.T.Eisinger, Phys. Rev. 94, 744, 747A; 95, 628A; 96, 658 (1954).

Au^{198} 79 119 2.70^d — Resonance — $Au^{197}(n)$ (4.94 ev) — $\sigma_s\Gamma^2 = 75.4$ — $\sigma_s/\sigma_t = 0.106$ — $E_n = 1$ to 14 ev — cryst

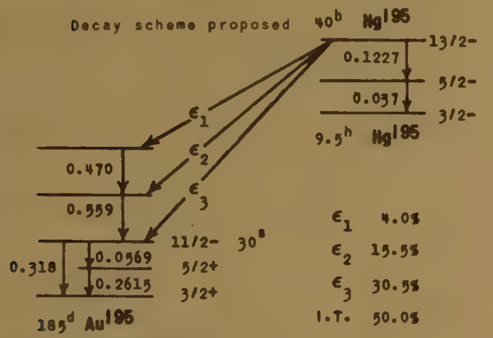
H.L.Foote, Jr., J.Moore, Phys. Rev. 98 (1955). BAPS 30, #1(New York), HA1.

$_{80}Hg$ — γ — $Hg(n,n'\gamma)$ — $E_n = 3.2$ — scin

st	0.38	1.21
	0.54	2.0
	0.90	

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

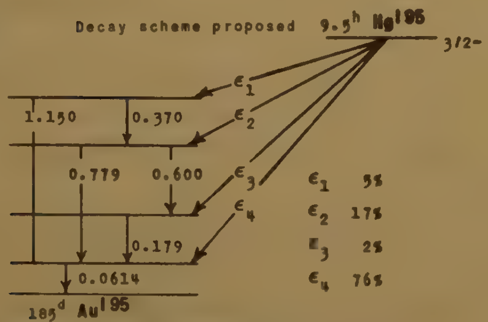
Hg^{195} 80 115 40^h



Supporting coincidence data not given

J.Bruner, J.Halter, O.Huber, R.Joly, D.Maeder, Helv. Phys. Acta 27, 512A, 572 (1954).

Hg^{195} 80 115 9.5^h



Supporting coincidence data not given

J.Brunner, J.Halter, O.Huber, R.Joly, D.Maeder, Helv. Phys. Acta 27, 512A, 572 (1954).

Hg^{197} 80 117 65^h — J — 1/2 — Au^{197}(15-Mev d,2n) — chem

μ — 0.52 1 — s

$\mu(65^h Hg^{197})/\mu(Hg^{199}) = 1.055 \pm 0.016$

F.Bitter, S.P.Davis, B.Richter, J.E.R.Young, Phys. Rev. 96, 1531 (1954).

Hg^{198} 80 118 stable — Level — (0.411) — $Hg^{(198)}(\gamma,\gamma)$ — J = 2 — Au^{198} at 1125°C — $\gamma\gamma(\theta)$

F.R.Metzger, Phys. Rev. 97, 1258 (1955).

Tl^{202} 81 121 12^d — d — $\sim 3\times10^{5y}Pb$ — chem

$\epsilon_K/\epsilon_L \sim 2.3$ from K x ray/ L x ray = 2.6 — scin

J.R.Huizenga, C.M.Stevens, Phys. Rev. 96, 548 (1954).

Tl^{204} 81 123 4.1^y — β^- — 0.762 5 — sl

Includes correction of −0.005 for 3% resolution

L.Feuvrais, T.Yuasa, Compt. rend. 239, 1627 (1954).

Tl^{208} 81 127 3.1^m — γ — 0.252 — s ce⁻

0.763 — scin, s ce

Both γ's coincident with 2.62 γ and are probably from new level at 3.961

L.G.Elliott, R.L.Graham, J.Walker, J.C.Wolfson, Proc. Roy. Soc. Canada 48, 12A (1954).

$_{82}Pb$ — γ — $Pb(n,n'\gamma)$ — $E_n = 3.2$ — scin

0.52†	0.35	0.18†	1.10
1.02†	0.52	0.25†	1.4
1.05†	0.80	0.16†	2.2

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Pb^{202} 82 120 $\sim 3\times10^{5y}$ — τ_2 — $\sim 3\times10^{5y}$ — p 12^dTl — chem

$Tl^{(203)}$(21-Mev d,3n)chem, ms

Assumed σ(21-Mev d,3n) = 0.5

(Tl^{202} L x ray) / (Pb^{202} L x ray) = 1.6 implies $\epsilon_s \sim 40\%$ for Pb^{202}

No K x ray (< 0.5% of Tl^{202} K x ray) — scin

J.R.Huizenga, C.M.Stevens, Phys. Rev. 96, 548 (1954).

Pb^{205} 82 123 ? — τ_{ϵ_K} — $> 6\times10^{7y}$

τ_{ϵ_L} — $\gg 3\times10^{5y}$

$Tl^{(205)}$(21-Mev d,2n) chem ms

J.R.Huizenga, C.M.Stevens, Phys. Rev. 96, 548 (1954).

Pb^{207} 82 125 0.82^s — τ_1 — 0.8^s 1 — $Pb^{208}(\leq 23$-Mev γ,n)

γ — 0.50 — scin

1.01

Threshold of ~9-Mev inferred from activation ratios of Pb to Ag and Cu for $12 \leq E_\gamma \leq 23$

J.M.Reid, K.G.McNeill, Phil. Mag. 45, 957 (1954); Proc. Phys. Soc. 66A, 1179 (1953).

Pb^{208} 82 126 stable — Level — g.s. — $Pb^{(207)}$(d,p) — $l_n = 1$ — $E_d = 15.1$ — scin d,p(θ)

N.S.Wall, Phys. Rev. 96, 670 (1954).

Bi^{207} 83 124 ~50y

γ — $x\gamma$* Pb(25-Mev p) chem; scin

157†	0.57	19
100†	1.07	6
≤1.6†	1.46	≤1.5
16†	1.76	7
0.72†	2.47	

(0.57 γ)(1.07 γ, 1.46 γ, 1.76 γ)
No 2.05 γ, 2.20 γ, 2.33 γ (< 0.14†)
No (0.57 γ) $\gamma\gamma$ No 0.187 γ, 0.87 γ
*Percent of photons coincident with K x ray

J.R.Prescott, Proc. Phys. Soc. 67A, 540 (1954).

γ scin

100†	(0.570)	
	(0.890)	
	(1.064)	
~0.1†*	(1.46)	
	1.77	E2,M1 or 25% E2,75% M3

(1.77γ)(0.570γ)(θ) J = 7/2, 5/2, 1/2*
or J = 9/2, 5/2, 1/2*
(1.46γ)(0.89γ)*
No 2.46γ (< 0.25†)*
ϵ_L only to 2.34 level
ϵ_K ~3% to 0.57 level

N.H.Lazar, E.D.Klema, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), S3; *verbal report.

Bi^{209} 83 126 stable†

γ — $Bi^{209}(n,n'\gamma)$ E_n = 3.2 scin

0.43†	0.49
1.2 †	0.94
0.59†	1.62
0.39†	2.6 ?

†σ in barns

V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 96, 386 (1954).

Bi^{210} 83 127 5.00d

J 1 s

K.F.Smith, quoted by E.A.Plassmann, L.M.Langer Phys. Rev. 96, 1593 (1954).

β^- 1.155 δ sm
Spectrum shape can be fitted by S, T interaction with ΔJ = 1,yes

E.A.Plassmann, L.M.Langer, Phys. Rev. 96, 1593 (1954).

β^- 1.17 sl
No γ (< 0.01%)
Spectrum shape can be fitted by S, T interaction with ΔJ = 1, yes

L.Lidofsky, N.Benczer, P.Macklin, C.S.Wu, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), S4.

Bi^{210} 83 127 2.6x10^6 y

Level — $Bi^{209}(d,p)$ E_d = 15.1 scin
d,p(θ) for proton group with Q = 1.94 not in agreement with simple theory for l_n = 2,4,6

H.S.Wall, Phys. Rev. 96, 670 (1954).

Bi^{212} 83 129 60.5m

(> 0.65γ)(≤ 1.50γ) scin
(> 0.80γ)(≤ 1.35γ)

F.Demichelis, Nuovo Cim. 12, 407 (1954).

Bi^{214} 83 131 19.7m

(0.61γ)(1.12γ) most intense cascade scin
Weak $\gamma\gamma$ for both γ's with 1.3 > E_γ > 0.61
All other $\gamma\gamma$ include 0.61γ
No (0.61γ)(γ) for E_γ > 1.6
~ 65% of all γ's belong to a cascade

F.Demichelis, R.Malvano, Nuovo Cim. 12, 358 (1954).

$Po^{197?}$ 84 113

τ ~4m Bi^{209}(170-Mev p) chem
α 6.040 s

S.Rosenblum, H.Tyrén, Compt. rend. 239,1205 (1954).

$Po^{198?}$ 84 114

τ ~6m Bi^{209}(170-Mev p) chem
α 5.935 s

S.Rosenblum, H.Tyrén, Compt. rend. 239, 1205 (1954).

$Po^{199?}$ 84 115

τ ~11m Bi^{209}(170-Mev p) chem
α 5.846 s

S.Rosenblum, H.Tyrén, Compt. rend. 239, 1205 (1954).

$Po^{200?}$ 84 116

τ ~8m Bi^{209}(170-Mev p) chem
α 5.770 s

S.Rosenblum, H.Tyrén, Compt. rend. 239, 1205 (1954).

Po^{201} 84 117 18m

τ ~17m Bi^{209}(170-Mev p) chem
α 5.671 s

S.Rosenblum, H.Tyrén, Compt. rend. 239, 1205 (1954).

Po^{202} 84 118 56m

τ ~55m Bi^{209}(170-Mev p) chem
α 5.575 s

S.Rosenblum, H.Tyrén, Compt. rend. 239, 1205 (1954).

Po^{204} 84 120 3.8h

τ ~3.8h Bi^{209}(170-Mev p) chem
α 5.370 s

S.Rosenblum, H.Tyrén, Compt. rend. 239, 1205 (1954).

Po^{208} 84 124 2.9y

α ~0.1% 4.784 s
~100% (5.109)

S.Rosenblum, H.Tyrén, Compt. rend. 239, 1205 (1954).

Po^{210} 84 126 138.4^d

τ	138.4005^d *58*		calorimeter

Five samples measured during 100-350 days

J.F.Eichelberger, K.C.Jordan, S.R.Orr, J.R.Parks, Phys. Rev. 96, 719 (1954).

Po^{211} 84 127 0.52^s

α	0.53%	6.569	d 7.5^hAt; s
	0.50%	6.895	
	99%	(7.43)	

No 6.34 α (<0.02%)

R.W.Hoff, UCRL-2325 (1953).

At^{210} 85 125 8.3^h

α	0.063%	5.355		s
	0.053%	5.437		
	0.054%	5.519		
γ	199*	0.0446		sd ce
			$L_{12}:L_3:M:N = 100:48:41:10$	
	33*	0.115	K : L : MN = 100 : 17 : 14	
	56*	0.243	$\alpha_K = 0.11$	E2
			K : L : MN = 100 : 83 : 25	
	1.8*	1.189	K : L = 100 : 21	
			$\alpha_K = 4.8\times10^{-3}$	E2
	0.21*	{1.458, 1.504}	$\alpha_K = 1.2\times10^{-3}$	E1

No 0.511 γ (<5%) scin

*Relative intensity ce

R.W.Hoff, UCRL-2325 (1953).

At^{211} 85 126 7.5^h

Bi^{209}(38-Mev α,2n) chem

α 5.862 s

$\epsilon_K/\epsilon_L \sim 7$ from K x rays/L x rays = 3.1_5 scin, pc

R.W.Hoff, UCRL-2325 (1953).

Ra^{223} 88 135 11.7^d

τ 11.68^d *6* pc

Counted over period of 116 days

G.R.Hagee, M.L.Curtis, G.R.Grove, Phys. Rev. 96, 817A (1954).

Th^{227} 90 137 18.2^d

τ 18.17^d *8* pc

Counted over period of 116 days

G.R.Hagee, M.L.Curtis, G.R.Grove, Phys. Rev. 96, 817A (1954).

Th^{234} 90 144 24.1^d

β^-		~0.10		$\beta\gamma$ scin
γ	6.5%	0.029	$\alpha_L = 10$*	scin
	6.5%	0.064	$\alpha_L = 0.25$*	
	14.8%	0.093	$\alpha_L = 2.5$*	

(~0.10 β) (0.029 γ, 0.064 γ, 0.093 γ)

(0.064 γ) (0.029 γ) No (0.093 γ) γ

*Using ce data of Stoker et al.

S.A.E.Johansson, Phys. Rev. 96, 1075 (1954).

D 6.66^hPa 0.63 ± 0.06%
from (1.18^mPa β^-)/(6.66^hPa β^-) GM

W.L.Zijp, Sj. Tom, G.J.Sizoo, Physica 20, 727 (1954).

Pa^{234} 91 143 1.18^m

β^-		~1.35			$\beta\gamma$ scin
γ	<0.19†	0.250	0.00†	(0.81)	scin
		0.33 ?	0.37†	1.00	
		0.38 ?	0.04†	1.81	
	0.12†	0.75			

(~1.35 β) (1.00 γ)   (~0.6 β) (1.81 γ)

β(0.75 γ)/β(1.00 γ) not f(E_β) for E_β > 0.7

†Photons per 100 Th^{234} disintegrations

S.A.E.Johansson, Phys. Rev. 96, 1075 (1954).

Pa^{234} 91 143 6.66^h

τ 6.658^h *12* d 24.1^dTh chem

Background of 24.1^dTh ~0.2%

W.L.Zijp, Sj. Tom, G.J.Sizoo, Physica 20, 727 (1954).

γ	<0.19†	0.250	Th^{234} chem; scin
	0.06†	0.76	
	0.07†	0.91	
	0.02†	1.68	

(0.91 γ) (0.25 γ)/(0.91 γ) (0.76 γ) ~1

†Transitions per 100 Th^{234} disintegrations

S.A.E.Johansson, Phys. Rev. 96, 1075 (1954).

U^{239} 92 147 23.5^m

Resonances $U^{(238)}$(n) E_n = 3 to 700 ev

σ_o (10^3b)	E_o (ev)	Γ (10^{-3}ev)	Γ_γ (10^{-3}ev)
23 ± 3	6.70 *6*	25.5 ± 2.0	24 ± 2
31 ± 6	20.9 *2*	33 ± 5	25 ± 5
37 ± 8	37.0 *3*	61 ± 7	29 ± 9
24 ± 10	66.5 *7*	44 ± 10	17 ± 10
	81.6	166	278
	90	192	297
	104	212	368
	118	242	418
	146	258	

R.S.Carter, Phys. Rev. 98 (1955).
BAPS 30, #1, (New York), HA5; verbal report.

Np^{234} 93 141 4.4^d

U^{235}(19-Mev d,3n) chem scin

γ	50†	{(0.76), (0.81)}	unresolved
	40†	1.57	
	100†	K x ray	
	70†	L x ray	

$\epsilon_K/\epsilon_L \sim 1.0$

R.W.Hoff, UCRL-2325 (1953).

Np^{235} 93 142 410^d

No γ observed

R.W.Hoff, S.G.Thompson, Phys. Rev. 96, 1350 (1954).

Np^{236} 93 143 $>5000^y$

U^{238}(21.6-Mev d,4n) chem ms

τ_β $>5000^y$

σ(n,f) = 2800

No α's observed other than Np^{237} α's lc

M.H.Studier, J.E.Gindler, C.M.Stevens, Phys. Rev. 97, 88 (1955).

Np^{237} 93 144 2.2×10^{6y}

g for 0.060 level = 1.4 ± 0.2 $\alpha\gamma(\theta,H)$

V.E.Krohn, T.B.Novey, S.Raboy, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), S10; verbal report.

Np^{239} 93 146 2.33^d

J 1/2 s

J.G.Conway, R.D.McLaughlin, Phys. Rev. 96, 541 (1954).

Pu^{234} 94 140 9^h

No γ (< 0.5%) U^{233} (36-Mev α,3n); scin

R.W.Hoff, UCRL-2325 (1953).

Pu^{237} 94 143 40^d

τ 40^d U^{235} (36-Mev α,2n) chem; Np^{237} (9.5-Mev p,n) chem

γ 39† ~0.064 (α_L ~1.1) scin

x 100† K x ray

77† L x ray

ϵ(0.060 level)/ϵ(g.s.) = 0.56

R.W.Hoff, UCRL-2325 (1953).

Pu^{238} 94 144 90^y

γ 0.0436 *3* $L_2,L_3 > L_1$* E2 s ce

$\tau < 5\times10^{-10}s$

0.1000 *4* $L_2,L_3 > L_1$* E2

E.L.Church, A.W.Sunyar, Phys. Rev. 98 (1955). BAPS 30, #1 (New York), S5; *verbal report.

Pu^{240} 94 146 6580^y

Resonance Pu^{239}(n,f) E_n = 0.008 to 10 ev

0.298 *2* ev Γ = 0.08ev

σ suggests negative energy resonance also

M.Galula, B.Jacrot, F.Netter, Compt. rend. 239, 1128 (1954).

Resonance Pu^{239}(n,f) E_n = 0.01 to 0.95 ev

0.300 *5* ev Γ = 0.09ev cryst

G.Vendryes, P.Hubert, J.M.Auclair, Compt. rend. 239, 1034 (1954).

Am^{241} 95 146 470^y

γ (0.060) dipole $\alpha,\gamma(\theta)$

T.B.Novey, Phys. Rev. 96, 547 (1954).

Am^{242} 95 147 16.0^h

β^- 0.628 Am^{241}(pile n,γ); sd

γ 0.041 *2* $\alpha_L > 200$ cryst, sd ce

$L_2 : L_3 : M_2 : M_3 : N$ = 100 : 74 : 67 : 44 : < 22

0.043 *2* $\alpha_L > 200$

$L_2 : L_3$ = 59 : 23

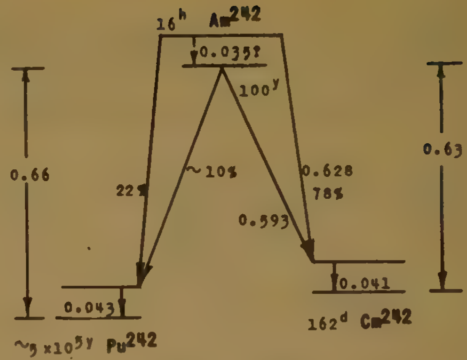
IT < 5% from L x ray intensities cryst

β^-/ϵ = 3.6 from L x ray intensities

ϵ_M/ϵ_L ~0.7 scin, cryst

(CONTINUED)

Am^{242} 95 147 16.0^h



R.W.Hoff, UCRL-2325 (1953).

Bk^{249} 97 152 290^d

τ 290^d *20* Pu(pile n) chem

α ~10^{-3}% 5.40 *5* ic

β^- 0.08 *2* a

τ for spontaneous fission $\geq 2\times10^{8y}$

L.B.Magnusson, M.H.Studier, P.R.Fields, C.M.Stevens, J.F.Mech, A.M.Friedman, H.Diamond J.R.Huizenga, Phys. Rev. 96, 1576 (1954); 94, 1083 (1954).

Cf^{246} 98 148 1.5^d

τ for spontaneous fission = 2.1×10^{3y}

E.K.Hulet, UCRL-2283; quoted by P.R.Fields, et al. Nature 174, 265 (1954).

γ ~0.043 α(ce)ppl

D.C.Dunlavey, G.T.Seaborg, quoted by R.W.Hoff, UCRL-2325 (1953).

Cf^{249} 98 151 ~470^y

τ 470^y *100* d 290^dBk chem, ms

α 5.81 *3* ic

No other α (< 5% of 5.81 α)

τ for spontaneous fission $\geq 5\times10^{6y}$

L.B.Magnusson, M.H.Studier, P.R.Fields, C.M.Stevens, J.F.Mech, A.M.Friedman, H.Diamond, J.R.Huizenga, Phys. Rev. 96, 1576 (1954); 94, 1083 (1954).

Cf^{250} 98 152 10^y

τ 10.0^y *2.4* Bk^{249}(pile n) chem, ms

α 10% 5.99 *1* ic

90% 6.03 *1*

(5.99 α)(L x ray) No (6.03 α)(L x ray)

τ for spontaneous fission ~1.5×10^{4y}

L.B.Magnusson, M.H.Studier, P.R.Fields, C.M.Stevens, J.F.Mech, A.M.Friedman, H.Diamond J.R.Huizenga, Phys. Rev. 96, 1576 (1954); 94, 1083 (1954).

Cf^{251} 98 153 $>18^d$

τ_β >> 18^d Pu(pile n) chem, ms

No α's observed ic

L.B.Magnusson, M.H.Studier, P.R.Fields, C.M.Stevens, J.F.Mech, A.M.Friedman, H.Diamond J.R.Huizenga, Phys. Rev. 96, 1576 (1954).

Cf^{252} 98 154 2.2^{y}	τ	2.2^{y} *2*	Pu(pile n)	chem, ms
	α 10†	6.08 *1*		
	90†	6.12 *1*		

(6.08 α) (L x ray) No (6.12 α) (L x ray)

τ for spontaneous fission ~66^{y}

L.B.Magnusson, M.H.Studier, P.R.Fields, C.M.Stevens, J.F.Mech, A.M.Friedman, H.Diamond, J.R.Huizenga, Phys. Rev. 96, 1576 (1954); 94, 1083 (1954).

Cf^{253} 98 155 18^{d}	τ	18^{d} *3*	Pu(pile n)	chem
	β^-			D 19^{d} 99

L.B.Magnusson, M.H.Studier, P.R.Fields, C.M.Stevens, J.F.Mech, A.M.Friedman, H.Diamond, J.R.Huizenga, Phys. Rev. 96, 1576 (1954); 94, 1083 (1954).

TABLE 2—NEUTRON CROSS SECTIONS

Absorption cross sections for neutron energies marked "th" (thermal) have been determined, from measurements in a thermal neutron flux, in terms of the cross section value of a "standard" for neutrons of velocity 2200 m/sec, or energy ~0.025 ev. The standard used is stated just after the reference and is generally one known to have a thermal absorption cross section with a 1/v energy dependence. If the nucleus whose cross section is being measured also has a cross section with 1/v dependence, the cross section found for it by comparison with the standard will, of course, be a cross section for 2200 m/sec. If not, and the dependence often is not known, the value found by the comparison is $\overline{\sigma v}/2200$.

Target	Energy	σ	Value of σ or $\int d\sigma$	Method	Ref.
H	0.0253 ev	a	0.333 *3*	mean life	54V10
	91	el(θ)	graph	p scin	54S39
Li^{6}	0.035–4.2	t	graphs		54J17
B	0.0253 ev	a	781^{h} *6*	trans	53E18
	0.0253 ev	a	785^{h} *8*	osc	54G61
	0.0253 ev	a	771^{a} *6*	osc	54G61
	0.0253 ev	a	764^{a} *3*	mean life	54V08
	0.0253 ev	a	749^{a} *4*	trans	53C35
	0.0253 ev	a	755^{a} *3*	trans	53K54
	0.0253 ev	a	761^{s} *3*	mean life	54V08
	0.0253 ev	a	763^{s} *3*	mean life	54V08
	h, Harwell standard			(trans = transmission)	
	a, Argonne-Brookhaven standard				
	s, two additional samples				
C	2.4–3.7	el(θ)	graphs	n scin	54M97
Cr	3.2	n,γ_1^*	table	γ scin	54S85
Fe	3.2	n,γ_1^*	table	γ scin	54S85
Co^{59}	3.2	n,γ_1^*	table	γ scin	54S85
Ni	th	s coh	13.1 *3*		54A40
	0.0033–0.33 ev	t	graph		54A40
	3.2	n,γ_1^*	table	γ scin	54S85
Cu	3.2	n,γ_1^*	table	γ scin	54S85
Zn	3.2	n,γ_1^*	table	γ scin	54S85
Zr	3.2	n,γ_1^*	table	γ scin	54S85
Mo	3.2	n,γ_1^*	table	γ scin	54S85
Ag	0.0253 ev	a	64.0 *5*	cryst	54A40
	0.0253 ev	a	63.7 *4*	osc	54G61
	0.0253 ev	s	4.2 *7*	cryst	54A40
	0.004–0.08 ev	t	graph		54A40
Cd	10–1000 ev	n,γ	graph	γ scin	54M87
	3.2	n,γ_1^*	table	γ scin	54S85
In	0.0253 ev	a	190 *2*		54A40
	0.0253 ev	s	8.6 *2.4*		54A40
	0.004–0.08 ev	t	graph		54A40
	3.2	n,γ_1^*	table		54S85
Sn	3.2	n,γ_1^*	table	γ scin	54S85
Ba	12–500 ev	n,γ	graph	γ scin	54M87
Ho^{165}	pile	n,γ	$\geq$0.03	$>30^{y}$Ho	55M08
$Er^{(168)}$	th	a	2.0 *4*	9.4^{d}Er	54B62
$Er^{(170)}$	th	a	8.7 *1.8*	7.5^{d}Er	54B62
Ta^{181}	3.2	n,γ_1^*	table	γ scin	54S85
Au^{197}	0.0253 ev	a	98.4 *9*		54E26
	0.0253 ev	a	96.5 *7*		54A40
	0.0253 ev	s	9 *2*		54E26
	0.0253 ev	s	8.7 *9*		54A40
	0.004–0.08 ev	t	graph		54A40

Neutron Cross Sections continued

Target	Energy	σ	Value of σ or $\int d\sigma$	Method	Ref.
Au^{198}	pile	a	18,000	S	54B99
Pb	3.2	n,γ_i^*	table	γ scin	54S85
Bi^{209}	3.2	n,γ_i^*	table	γ scin	54S85
Ac^{227}	th	a	516	$1.9^y Th$	54S70
U	0.0253 ev	s coh	2.8		54E25
U^{235}	0.0253 ev	a	720 *15*		54E25
		s	8.6 *3*		54E25
U^{238}	0.0253 ev	a	2.8 *1*		54E25
$>5000^y Np^{236}$	pile	n, f	~2800		55S10
Bk^{249}	pile	a	350	$10^y Cf^{250}$	54M90
Cf^{250}	pile	a	~1500	ms	54M90
Cf^{251}	pile	a	~3000	ms	54M90
Cf^{252}	pile	a	25	$18^d Cf^{253}$	54M90

*Cross sections were measured for specific γ's whose energies are given in the reference.

53C35 R.S.Carter, H.Palevsky, V.W.Myers, D.J.Hughes, Phys. Rev. 92, 716 (1953); 91, 450A (1953).

53E18 P.A.Egelstaff, AERE N/M 62 (1953).

53K54 C.W.Kimball, G.R.Ringo, T.R.Robillard, S.Wexler, quoted by B.Hamermesh, G.R.Ringo, S.Wexler, Phys. Rev. 90, 603 (1953).

Neutron Cross Sections continued

54A40 R.G.Allen, T.E.Stephenson, C.P.Stanford, S.Bernstein, Phys. Rev. 96, 1297 (1954).

54B62 R.F.Barnes, ANL-5287 (1954); Au standard.

54B99 R.E.Bedford, A.M.Crooker, Proc. Roy. Soc. Canada 48,27A(1954); Hg^{198}/Hg^{199} atomic spectra.

54E25 P.A.Egelstaff, J. Nuclear Energy 1, 92 (1954).

54E26 P.A.Egelstaff, J. Nuclear Energy 1, 57 (1954).

54G61 A.Green, D.J.Littler, E.E.Lockett, V.G.Small, A.H.Spurway, J. Nuclear Energy 1, 144 (1954); Based on σ_a(Au) = 98.6.

54J17 C.H.Johnson, H.B.Willard, J.K.Bair, Phys. Rev. 96, 985 (1954).

54M87 E.Meservey, Phys. Rev. 96, 1006 (1954).

54M90 L.B.Magnusson, M.H.Studier, P.R.Fields, C.M.Stevens, J.F.Mech, A.M.Friedman, H.Diamond, J.R.Huizenga, Phys. Rev. 96, 1576 (1954).

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TABLE 3—GROUND STATE Q'S

Q values are defined by the conservation equation, $M_1 + M_2 = M_3 + M_4 + Q$ or $Q = E_3 + E_4 - E_1 - E_2$ where the M's are the rest masses and the E's the kinetic energies of the reacting particles. Ground state Q's are those measured when the product particles are left in their lowest energy states. If the most energetic emitted particle has escaped detection, the true ground state Q is greater than the value given.

The energy standard used, when clearly stated by the experimenter, is mentioned with the reference. Usually the energy measurement for only one particle, either the incident or emitted light particle, presents difficulties It is the standard used for this particle that is given.

N. B. A uniform policy for denoting the use of enriched or monoisotopic material is now in use in all four New Nuclear Data tables. This policy is described in the section on Conventions just following the Introduction. Briefly, parentheses around the A value indicate natural material, no parentheses enriched or monoisotopic material.

Reaction	Value		Source	Detector	Ref.
$He^3(d,\gamma)Li^5$	16.36	*20*	VdG	scin	54B89
$Li^6(t,d)Li^7$	0.986	*7*	CcW	s	54A35a
$Li^6(t,p)Li^8$	0.790	*11*	CcW	s	54A35b
$Li^7(t,\alpha)He^6$	9.79	*3*	CcW	s	54A35c
$Be^9(d,p)Be^{10}$	4.586	*9*	VdG	sπ	54J23
$C^{(12)}(d,p)C^{(13)}$	2.717	*10*	VdG	sπ	54S101
$C^{13}(d,p)C^{14}$	5.942	*11*	VdG	sπ	54S101

Ground State Q's continued

Reaction	Value		Source	Detector	Ref.
$C^{14}(d,p)C^{15}$	0.15	15	VdG	2.4°C	54R38a
	0.12	5			54R38b
$N^{(14)}(\alpha,n)F^{(17)}$	-4.73	10	Cyc	sπ	55D01
$O^{(16)}(d,p)O^{(17)}$	1.915	10	VdG	sπ	54S101
$O^{17}(d,p)O^{18}$	5.821	10	CcW	sd	54A37
$O^{18}(d,p)O^{19}g.s?$	1.730	8	CcW	sd	54M89
$Na^{23}(\alpha,n)Al^{26}$	-2.9		Cyc	pc	55D01
$Al^{27}(p,\alpha)Mg^{24}$	1.61	4	Cyc	ppl	54G55
$P^{31}(p,n)S^{31}$	-6.03	15	Cyc	ppl	55R02
$P^{31}(\alpha,p)S^{34}$	0.5		Cyc	scin	55P03
$S^{(32)}(\alpha,p)Cl^{(35)}$	-2.3		Cyc	scin	55P03
$Ca^{48}(d,p)Ca^{49}$	2.80	30	Cyc	scin	54W33
$Co^{59}(d,p)Co^{60}$	5.283	8	VdG	sπ	54F27
$Zn^{68}(d,p)Zn^{69}$	4.16	15	Cyc	scin	54E22
$Rb^{85}(d,p)Rb^{86}$	6.2	3	Cyc	scin	54W33
$Rb^{87}(d,p)Rb^{88}$	3.75	20	Cyc	scin	54W33
$Sr^{84}(d,p)Sr^{85}$	5.25	30	Cyc	scin	54W33
$Sr^{86}(d,p)Sr^{87}$	6.26	20	Cyc	scin	54W33
$Sr^{88}(d,p)Sr^{89}$	4.29	15	Cyc	scin	54W33
$Y^{89}(d,p)Y^{90}$	4.41	5	Cyc	scin	54W33
$Zr^{92}(d,p)Zr^{93}$	4.46	5	Cyc	scin	54W33
$Zr^{94}(d,p)Zr^{95}$	4.19	5	Cyc	scin	54W33
$Mo^{92}(d,p)Mo^{93}$	5.63	5	Cyc	scin	54W33
$Mo^{96}(d,p)Mo^{97}$	4.51	30	Cyc	scin	54W33
$Mo^{97}(d,p)Mo^{98}$	6.06	10	Cyc	scin	54W33
$Cd^{112}(d,p)Cd^{113}$	4.10	9	Cyc	scin	54W33
$Cd^{114}(d,p)Cd^{115}$	3.52	15	Cyc	scin	54W33
$Sn^{120}(d,p)Sn^{121}$	3.92	7	Cyc	scin	54W33
$Sn^{124}(d,p)Sn^{125}$	3.52	7	Cyc	scin	54W33
$Te^{124}(d,p)Te^{125}$	4.25	7	Cyc	scin	54W33
$Te^{(125?)}(d,p)Te^{(126?)}$	5.0	2	Cyc	scin	54W33

Ground State Q's continued

Reaction	Value		Source	Detector	Ref.
$I^{127}(d,p)I^{128}$	4.35	5	Cyc	scin	54W33
$Cs^{133}(d,p)Cs^{134}$	4.50	10	Cyc	scin	54W33
$La^{(139)}(d,p)La^{(140)}$	2.87	10	Cyc	scin	54W33
$Ce^{140}(d,p)Ce^{141}$	3.17	10	Cyc	scin	54W33
$Ce^{142}(d,p)Ce^{143}$	2.86	7	Cyc	scin	54W33
$Pr^{141}(d,p)Pr^{142}$	3.42	30	Cyc	scin	54W33
$Nd^{142}(d,p)Nd^{143}$	3.79	8	Cyc	scin	54W33
$Sm^{154}(d,p)Sm^{155}$	3.36	30	Cyc	scin	54W33

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TABLE 4—MASS DIFFERENCES

Differences are given in millimass units

	Value		Ref.
Li^{6}/Li^{7}	0.857342	2	54H63
K^{39}/K^{41}	0.951225	7	54H63
$3Cu^{63} - Os^{189}$	-169.8	9	54P34
$3Ni^{64} - Os^{192}$	-179.7	6	54P34
Br^{79}/Br^{81}	0.975300	7	54H63
Rb^{85}/Rb^{87}	0.977017	5	54H63
	0.977016	5	54T35
$2Ru^{98} - Pt^{196}$	-154.0	6	54P34
$2Ru^{99} - Pt^{198}$	-152.6	4	54P34
$Os^{189} - 3Cu^{63}$	+169.8	9	54P34
$Os^{192} - 3Ni^{64}$	+179.7	6	54P34
$Pt^{196} - 2Ru^{98}$	+154.0	6	54P34
$Pt^{198} - 2Ru^{99}$	+152.6	4	54P34

54H63 A.Honig, M.Mandel, M.L.Stitch, C.H.Townes, Phys. Rev. 96, 629 (1954).

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